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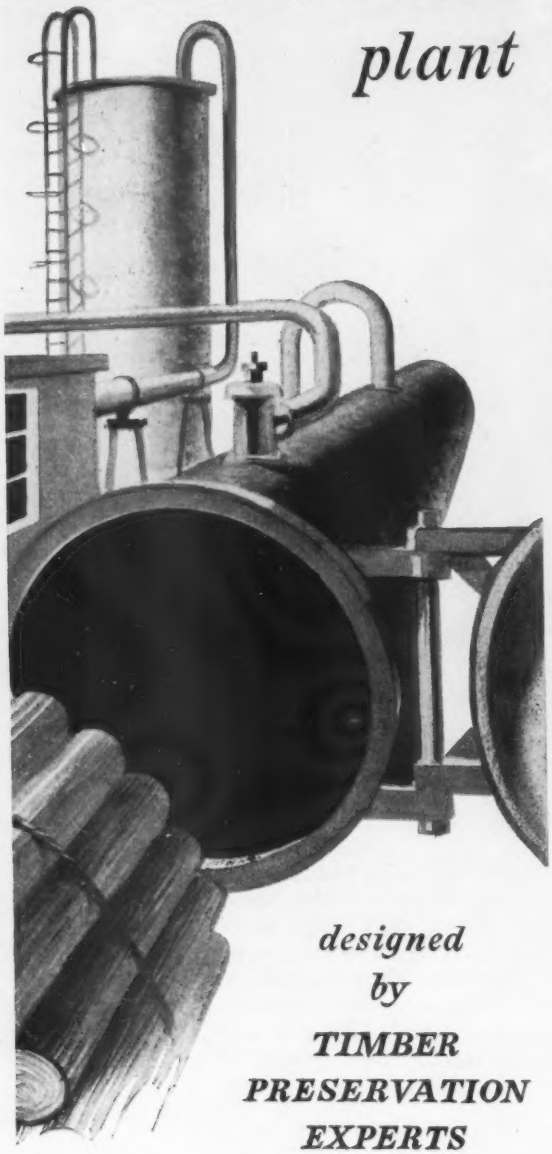

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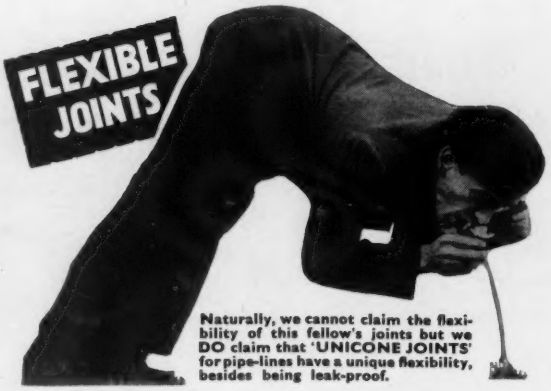
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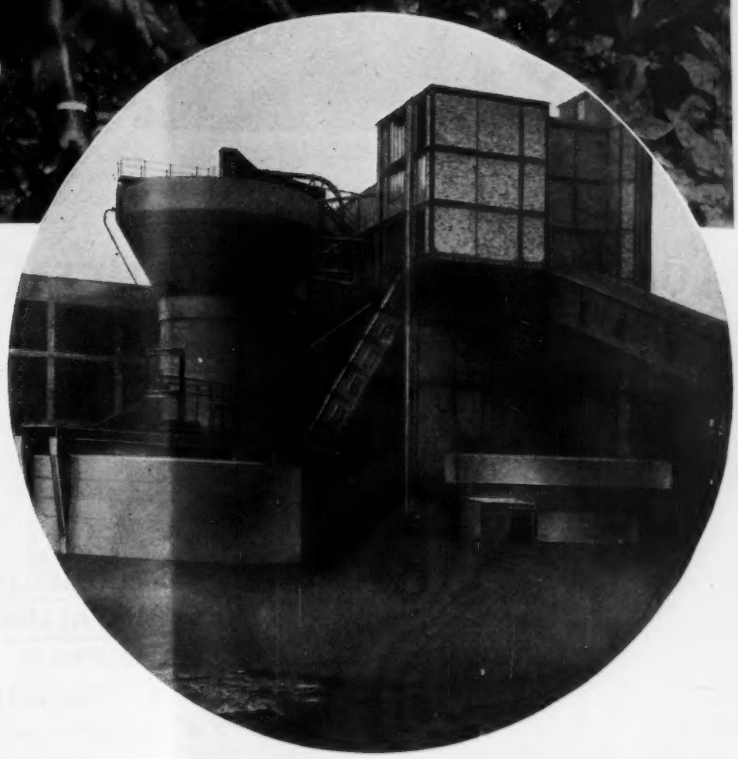

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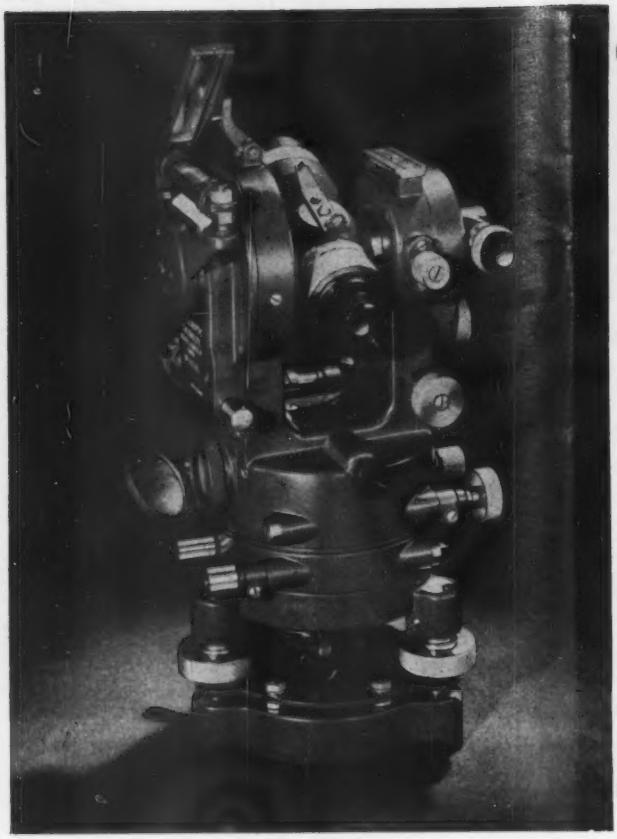

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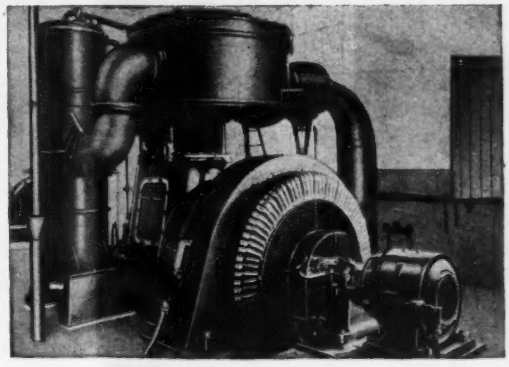

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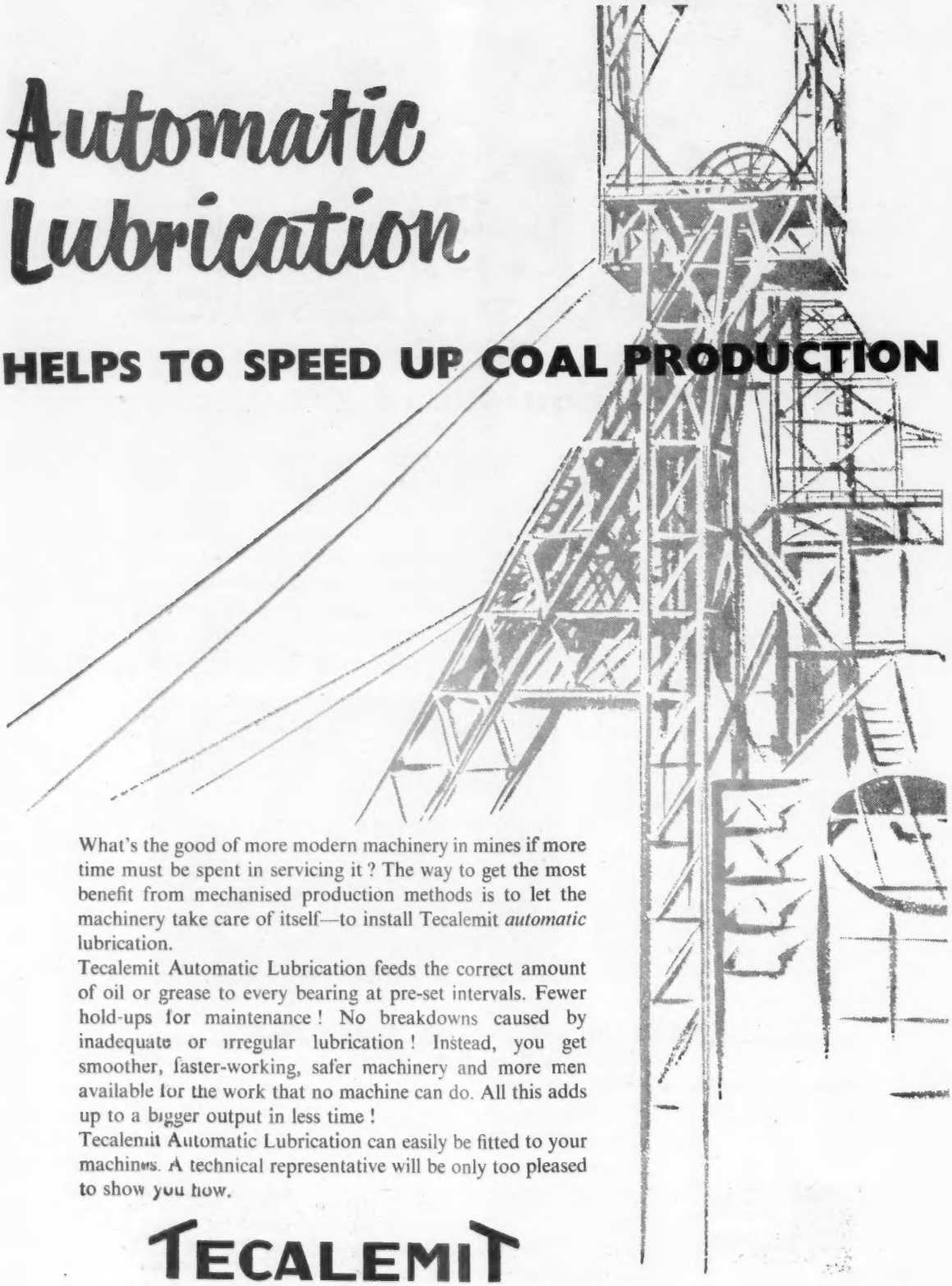

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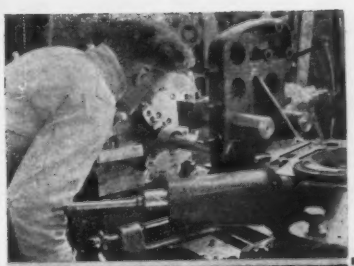

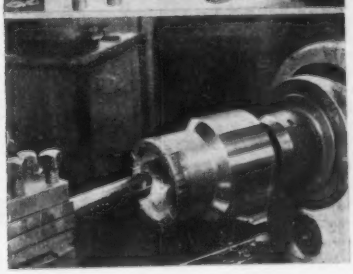

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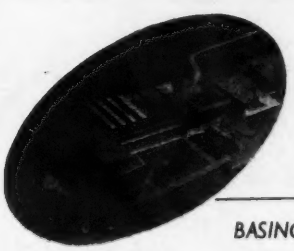

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CONTENTS

Notes and Comments	**321**
From Our Own Correspondent — Australia; Western United States	**323**
Problems of the American and European Coal Industries	**325**
Exploitation of Southern European Mineral Resources	**326**
Faulting in the Orange Free State	**327**
Death of F. H. Brownell	**327**
Mining and The Royal Society of Arts	**328**
Some Engineering Features in Modern Ore Dressing and Smelting Practice	**329**
Machinery and Equipment	**331**
Metals, Minerals and Alloys	**334**
The Mining Markets	**336**
Company News and Views	**337**
Company Meetings and Announcements — The National Bank of India Limited	**340**

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NOTES AND COMMENTS

The Price of Gold

While the official United States Government price for gold purchases was again unchanged throughout last year at $35 per f.oz., there were two noteworthy developments during the period. First there was the gradual decline in the free gold market price from $38.20/$38.30 to practical parity at the end of the year. The second development was the advent of substantial disposals by the U.S.S.R. estimated by Messrs. Samuel Montague and Co. at around 1,000,000 oz. to the free market, and reports of up to 2,000,000 oz. bought by the Bank of England, though there is no official confirmation of this last line.

While supplies of gold to the free market declined from an estimated total of 12,000,000 oz. in 1952 to 7,000,000 oz. last year this was a reflex of the loosening of the control by the International Monetary Fund of its restriction policy on such sales. How far this movement towards liberalization was directly inspired by the aim of restricting or even extinguishing a free gold market, and how far it was induced by resistance, more particularly from South Africa, to the rigidity of the International Committee in the matter of price control, it is as yet impossible to say. At any rate active criticism of the operation of the I.M.F. has for the time being largely died away.

As far as the United States is concerned, with the tremendous legislative jam with which Congress appears to be faced at the present time, it seems highly improbable that we shall hear anything more this year of legislation aimed at a change in United States policy which would permit the revalorization of gold in that country.

So far as Russia is concerned we have no means of judging what stores of the precious metal are in the Soviet coffers and how far they are now desirous of using them in accordance with the orthodox, if old fashioned, principles, of settling large scale imports of machinery and goods which their expressed desire to expand foreign trade suggests. Obviously if Russia is willing to dispose of large quantities of gold at the conventional price of $35 per f.oz. the continuance of this world price is indicated for the present, but if, as now seems possible, we are to witness a gradual expansion of world trade, the desirability of a fixed standard of values and stability of currency exchanges will become more necessary and if so we may look for an increased need for gold and an eventual improvement in its quotation.

Gold production last year would appear to have varied but little from that of 1952, being estimated by the Union Corporation at some 26,500,000 f.oz. as against 26,563,000 f.oz. in the previous year—assuming the Corporation's conventional estimate of Russian output still at 2,000,000 oz. What the actual figure is we have not idea, but guesses vary from this figure up to 9,500,000 oz.

Eastern Trading Conditions

It would only have been appropriate to the circumstances if Mr. V. A. Grantham could have announced a past year of boom activity and an outlook of high promise in his statement prefacing the centenary meeting of The Chartered Bank of India, Australia and China.

But this is 1954 and, established as it is throughout southern and south-eastern Asia and the Far East, the Bank has, as Mr. Grantham said, "given many hostages to fortune" and he is unwilling to speculate far ahead on the future of British banking in the area. Although "in certain countries the economic outlook is undoubtedly better" and "in others there is a more settled political outlook," there are many difficulties ahead, the chief of which Mr. Grantham believes was the instability of Japan. In general, however, though profits may be harder to earn (and when earned smaller than was customary), the prospect of earning them has become rather more certain.

Something of the same cautious optimism may be found in Mr. Michie's report to the National Bank of India. 1953 was a year in which the world struggled—with much pain—to a more natural balance of international commerce.

Clearly he feels that the struggle will continue to be tough, but it is something to know that the general direction of effort is correct and he would no doubt agree with Mr. Grantham's metaphor that the storm centre has, in many countries, been passed, though he would hesitate to estimate the time needed to reach the periphery. Mr. Michie is particularly concerned with the problems of Kenya and East Africa where the hazards include the (quite literally) incalculable effects of Mau Mau. What is encouraging in both reports is the flexibility of two long-established banks

in meeting the changed, and still rapidly changing, conditions; this means operating in difficult circumstances in traditional areas and meeting new developments elsewhere by a redeployment of resources. (Grindlays Bank is opening in the Rhodesias).

On the whole, Mr. Grantham's view that the possibility of earning some profit is hardening is the most hopeful forecast for it is in this respect that most doubts lie. Erstwhile out-and-out nationalist countries are now falling over themselves to pass laws encouraging the import of foreign capital and permitting the repatriation of handsome profits and, ultimately, the capital itself. The laws are excellent but they do not and cannot guarantee conditions in which profits may be earned for repatriation; and so long as operating expenses are allowed to rise unchecked, excessive labour employment quotas are required, and the entry of key executives is restricted, adequate profits are unlikely to be earned.

The problem is essentially political. If Communism is to be fended off from Asia and the East, in the long run foreign capital is required; but if it is to be fought off in the short run then governments appear compelled to promise their peoples conditions which make it impossible for foreign capital to earn its keep. The dilemma is complete and only strong government or a kind hitherto lacking in south east Asia and the Far East can break it.

New Mineral Dressing Degree Course at the R.S.M.

Impressive as is the new Bessemer Laboratory, the official opening of which took place at the Royal School of Mines on Wednesday of this week, its true value can only be measured by the contribution which it makes in the years ahead towards regaining for Britain her leadership in the field of mineral dressing. Indeed, the new laboratory has been conditioned by the exacting requirements of the newly instituted mineral dressing degree course, so that its design no less than its contents have been shaped to provide facilities sufficiently extensive to satisfy alike the demands of what will be one of the few fully specialized mineral dressing degree courses in the world and of the highly technological needs of research into the fundamental problems in the field of mineral dressing. An account of the laboratory and its equipment appears on page 331 of this issue.

Mineral dressing has, of course, been a compulsory subject for students of mining and metallurgy at the Royal School of Mines for many years. But it became apparent after the 1939-1945 war that technical advances in ore dressing had progressed beyond the point at which solid foundations in this *expertise* could be acquired by students in what, in effect, amounted to a one year course. Nor could a system of apprenticeship be relied upon to fill the widening gaps in their knowledge. A new discipline was needed which would approach the subject of mineral dressing on as wide a basis as possible rather than as an adjunct of the established courses in mining and metallurgy.

Accordingly, the college authorities examined the syllabus and the scope of the subject and after consultation with industry agreed that teaching and research facilities should be expanded. At the same time, at the request of the Ministry of Supply, the Standing Committee on Education of the Institution of Mining and Metallurgy investigated and subsequently reported on the desirability of research work and training at a high level in the subject of mineral dressing. The proposals put forward by the Institution of Mining and Metallurgy were accepted by the University Grants Committee which offered the Imperial College a recurrent grant for financing the project.

It should not be thought that the path towards this "emancipation" of mineral dressing has been uniformly easy, and all the difficulties attendant upon the hiving off of a new specialist degree course have almost inevitably been experienced. Indeed, even now there may be purists still unconvinced of the necessity of raising the principles and practice of mineral dressing above the status of "higher technical training" into the rarified atmosphere of an intellectual discipline.

Aside from the academic problems, a further major task was the design and equipment of the laboratory which is the concrete expression of the plans evolved over a period of four years by Mr. E. J. Pryor, Reader in Mineral Dressing, assisted by Dr. M. G. Fleming, Senior Lecturer, and Mr. H. N. Blyth, Lecturer, whose combined experience and training have been available to launch the course on its promising career.

The new mineral dressing degree course falls between the syllabuses of mining and of metallurgy. In the first year, all three courses share a common syllabus. But after the end of the first year mineral dressing places more emphasis on physical chemistry than does the mining course which at this point becomes quite separate. Metallurgical and mineral dressing students continue together for a further six months after which mineral dressing gives greater attention to mineralogy. In the third and final year, mineral dressing students undergo an intensive training in specialized mineral dressing problems. In a three year period the new course will provide a fundamental training in all sciences affecting the subject, together with practical ore dressing experience.

Two additional points must be mentioned. Firstly, mining economics has been included in the syllabus in recognition of the growing demand for graduates with a more balanced picture of the mining industry. Secondly, students are expected to work in mineral dressing plants in their vacations—a task made easier by the close co-operation existing between the Royal School of Mines and the mining companies.

That approximately £80,000 has been expended on building and equipping one of the finest mineral dressing laboratories in the world clearly underlines the importance attaching to the new course. But it does not provide any clues as to the compelling reasons which urged Mr. Pryor and Dr. Fleming, of the Royal School of Mines, to drive home the necessity for the establishment of the new mineral dressing degree course. To appreciate these reasons it is necessary to go back to the immediate post-war period when it was realized that technological advances in ore dressing had outstripped their own facilities for dealing adequately with such developments. However, other countries had also assessed the situation correctly and had gone ahead with plans for expanding their mineral dressing facilities, with the result that graduates, particularly from the United States, had begun to secure milling jobs in South African gold mines formerly considered to be a preserve of British students. Nor could this be considered as merely a challenge to the Royal School of Mines. Equipment follows the man, and the mill manager in fact, if not in form, does the buying. The potentially adverse effect on British manufacturers of mining machinery was consequently obvious.

Nor was that all. Ore deposits rich in content and simple in structure are, in general, becoming progressively exhausted. To-day, the need is for milling personnel able to obtain a high recovery from complex or low grade ores—a problem beyond those without specialized knowledge. Thus it follows that the new mineral dressing degree course should supply potentially better mill managers than either the mining or metallurgy faculties. Nevertheless the new mineral dressing department with its staff of 18, consisting of one Reader, one Senior Lecturer, five other Lecturers

and 11 senior technicians, technicians and laboratory attendants, will also be available to the mining and metallurgy departments. This will, of course, be of immeasurable assistance to both these departments, particularly during the students' first year when all three courses follow a common syllabus.

One of the most important features of the whole project, especially when the aspirations of the new course are considered in a world context, is the very great advantage naturally accruing to the Royal School of Mines by virtue of it being an integral part of the Imperial College of Science which is itself undergoing a process of expansion. A traditional feature of the Imperial College has been the close collaboration between its three constituent colleges and this has already proved of great assistance. For example, when the mineral dressing department was examining the relationship of ultrasonics to mineral dressing the valuable facilities and advice of the City and Guilds College were available, while in another problem connected with flotation re-agents, the co-operation of the Royal College of Science and other scientific bodies devoted to organic chemistry were called in to assist in unravelling the problem.

Whatever the value of the new mineral dressing course, it is to be regretted that its benefits are not to be widely available as yet. The intake of students is to be limited to approximately ten per annum. The justification for this policy is that to admit a larger number would mean a lowering of the high standards envisaged. *Prima facie*, this is an appealing argument. It is understandable that initially the intake should be limited to a small number while the new course is being "run in," but that this should be continued beyond the early years means that the benefits to industry of the new course must remain small in relation to the cost of establishing the facilities, and, if the course proves to be as successful as is hoped the pressure from industry to expand the intake of students will presumably become heavy. Should that imply a further increase in staff and facilities then the University Grants Committee must think again or industry must come to the rescue and provide the necessary funds.

In any event, there will clearly be need in due course for a Chair of Mineral Dressing so that the autonomy of the newly established discipline can be complete. The current arrangements whereby mineral dressing remains a part of the mining department is presumably no more than transitory.

Healthy Tone of U.K. Steel Industry

The recession in the American steel industry continues. Production has dropped below 70 per cent of capacity, and apart from the strike period, is now at the lowest level for four years. In Western Europe also producers are not fully employed, and price cutting is general. But the tide of recession has not yet reached the shores of Britain. Production is only slightly below its highest peak, and on the north-east coast has in fact exceeded all past records. New orders are coming along quite steadily and only the re-rolling mills lack full employment.

In view of the intensification of foreign competition, the authorities are plainly reluctant to sanction any rise in prices. Thus it happens that although advances have been authorized this month in railway rates and in the fixed maximum prices of pig iron and scrap, no variations in steel prices have been permitted pending further consideration by the Iron and Steel Board. Whether the steel industry can absorb all these extra costs of production is a moot point, but it may be that the present healthy flow of specifications is in part due to the anticipation of a rise.

The advance in scrap prices is a small matter, strictly limited to the extra cost of transport, but the rise in pig iron prices ranges up to 9s. per ton. On the part of consumers there has been no hesitation to pay these extra charges. For the big steel makers it is largely a matter of book-keeping since they operate their own blast furnaces. But buyers of all grades of foundry iron have not hesitated to follow the rise. Even the requirements of the makers of light castings are now on an expanding scale and the overall production of pig iron is barely sufficient to cover requirements without supplementary supplies of imported material. Preparations are therefore in hand to bring further blast furnace capacity into operation as quickly as possible. Good scrap supplies are coming forward, and imports are running at the rate of about 800,000 tons per annum, whilst arrivals of foreign ore are now coming in at a record rate.

Australia

(From Our Own Correspondent)

Melbourne, February 27.

It is expected that production of uranium oxide on a commercial scale will be commenced at Rum Jungle about the middle of the year. The treatment plant will also treat ore from prospectors and small producers, and doubtless from other companies that may develop occurrences of commercial importance to a company. While there is widespread occurrence of uranium over a wide area, the commercial importance of the deposits is far from being indictated, let alone assessed. Meantime, the boom continues.

It will be recalled that in our correspondent's note in "Company News and Views" in *The Mining Journal* of February 26, 1954, he pointed out that uranium had been found in Western Australia at the Dundas Goldfield, and that Uranium Mines N.L. and Norseman Gold Mines N.L. had agreed to co-operate in the exploitation of the field. It is now reported that a company, known as Western Australian Uranium N.L., has been formed to take over areas at Lake Dundas from Norseman Gold Mines N.L. and Uranium Mines N.L., in which showings of radioactive material have been discovered. Other country in the Ravensthorpe gold-copper district, 150 miles to the south-west, has also been taken up. Churn drilling is in progress on the original leases at Lake Dundas, where uranium-bearing material is stated to have been exposed by nine trenches in a distance of 1,000 ft. The commercial value of the reported discoveries has yet to be proved.

This gives added interest to the report that the Rio Tinto Mining Company is investigating the possibilities of uranium mining in the Northern Territory. In the last few months company executives have visited areas in the vicinity of Rum Jungle and Darwin. The company's geologist, Dr. Junner, spent some weeks in inspecting indications over one area.

The geologist in charge of the company's uranium development, Mr. C. W. Pegg, has arrived in Australia from South Africa and is expected shortly in the Northern Territory. The company is said to be interested in an extensive uranium-bearing area near Darwin.

ACTIVITIES IN OTHER STATES

Although much intensive examination for new supplies of copper ore was carried out in South Australia during the war years, further effort is to be made by the Department of Mines. Selected areas are in the Wallaroo-Kadina-Moonta district where the important Wallaroo and Moonta copper mines worked for many years. The search will be made in country at a distance from the old mines, where it is hoped that new deposits may be found.

The Sydney basin, that large area occupied by the

northern coalfields, extending from Sydney for about 200 miles northward, is to receive renewed attention in the examination of its oil and gas possibilities, by a company, Australian Oil and Gas Corporation, with a nominal capital of £A5,000,000. Some work was done years ago, and bores, reaching a maximum depth of about 4,000 ft. disclosed showings of gas. The new company has an area of 3,150 sq. miles in the Sydney Basin, and has applied for a further 2,250 sq. miles in that basin; in addition, 6,000 sq. miles of country are held in the Clarence River Basin, to the north. It is stated that several good structures have been located in the areas held. The objective will be the Permian marine beds underlying the coal measures.

Australian Development, the Tennant Creek gold mine, continues production of 2-3 oz. per ton ore, at the rate of 1,200 tons of ore per month; ore reserves approximate 10 years' life, but it may be significant that development has not exceeded a depth of 230 ft. It has been reported that a big copper deposit has been found south-west of Alice Springs, but the report should be regarded with caution.

Western United States

(From Our Own Correspondent)

Portland, Oregon, March 1.

Dissatisfaction of the members of Independent Mine, Mill and Smelter Workers' Union with the policy set by its officers reached a head at Butte, Montana, when three locals severed all connection with " Mine-Mill " and applied for charters from the United Steel Workers of America (C.I.O.). Despite non-communist affidavits filed by officers of Mine-Mill it has long been known that it has followed the party line and in 1950 it was expelled from C.I.O. because of this policy. Since then several locals have sought affiliation elsewhere, mostly with United Steel Workers, but the defection of the three locals at Butte, long one of the strongest union centres in the country, is the most severe blow to date and other locals are expected to follow the example of their co-workers in that district.

Mr. Walter P. Reuther, president of C.I.O., stated that since Mine-Mill was expelled in 1950 it has lost half of its membership and further deterioration will come fast. Meanwhile other troubles threaten to plague it. Congress and the National Labor Relations Board are making definite plans to curb Communist-dominated unions. One official who was found guilty in a Texas State Court of filing a false non-communist oath is under indictment on more serious charges and it is expected that his trial may have sensational developments. Recently the New Mexico Supreme Court (*The Mining Journal*, December 18, 1953) upheld convictions of six Mine-Mill officials for actions during a strike against New Jersey Zinc Co.'s mine at Hanover.

METAL FEATURES

There seems to be some improvement in the demand for copper but producers are trimming their sails against a future rendered uncertain by lack of action in the Chilean situation. Anaconda and Kennecott have reduced the work week from six to five days and Phelps-Dodge has announced an 1,100 ton reduction in monthly output. Kennecott's cutback is equivalent to 5,100 tons of copper monthly.

In the zinc industry Athletic Mining and Smelting Co. is closing its zinc smelter at Fort Smith, Arkansas, American Zinc is doing the same at its Hillsboro, Illinois plant and St. Joseph Lead Co. has reduced output at its zinc smelter at Josephtown, Pennsylvania, by 1,500 tons monthly. A.S. and R. announces a reduction of 900 tons a month at its Amarillo, Texas, plant and states that its El Paso fuming plant will cut production 29 per cent.

Despite the discouraging news it is quite evident that producers expect the situation to right itself in time, as development looking towards future production goes on. This is particularly true in the Coeur d'Alene district in Idaho which is in the fortunate position that its ores carry substantial amounts of silver. In fact it almost might be said in some cases that the lead and zinc are the byproducts. Here Sullivan has just completed an 8,500 ft. mill level tunnel; Lucky Friday has started raising a three-compartment shaft from the 1,800 to its main adit level; Hecla, associated with Newmont and New Jersey Zinc, is carrying on deep development on the Atlas, south of the Osborn fault, one of the major geological features, and has acquired control of two miles along Dead Man's Gulch, north of the fault, for development. Aside from the above, many lesser projects are being carried on in the district. At Eureka, Nevada, Eureka Corporation (Ventures Ltd.) appears to be actuated by a " never say die " spirit in its battle with water at its Fad shaft on the old Richmond-Eureka ground. Latest move is to call Cementation Co. of London in consultation as to the feasibility of grouting the formation surrounding the shaft. Eureka Corporation is playing for high stakes and if it is successful any time and money involved will be well spent. Meanwhile, the new discovery a mile north of the Fad (*The Mining Journal*, February 5, 1954) may prove to be a life saver.

GENERAL MINING DEVELOPMENT

Central Eureka, long one of the old standbys of the California Mother Lode, has entered into a two-year exploration and development campaign at its mine at Sutter Creek. The two shafts, 4,150 and 4,800 ft. deep, will be deepened and a diamond drilling campaign carried on. Production will be increased from 350 to 500 tons per day. Central Eureka has been one of the leading gold producers since the days of the Gold Rush and was one of the first to resume operation after the removal of the ban placed on gold mining in 1942.

Climax Molybdenum Co. in Colorado has placed its Mill No. 4 in operation which brings plant capacity to 27,000 tons daily and makes Climax next to the largest underground operation in the world. In expanding its operations the company is drawing on some submarginal ore bodies, relying on a government contract which protects it against loss.

Drilling in an area adjacent to Iron Mountain in Wyoming has indicated a body of ore in excess of 200,000,000 tons containing iron, titanium and vanadium. Sample averages have shown as high as 46 per cent iron, 19 per cent titanium and 1 per cent vanadium. Iron Mountain has been a source of iron ore for many years but this outlying district has not been developed prior to the recent drilling. If subsequent developments bears out the preliminary exploration it will become an important source of much needed titanium ore.

Uranium continues to occupy the spotlight, especially in the Colorado Plateau region. Golden Cycle, of Cripple Creek fame, has completed its 635 ft. shaft at Uravan and has commenced production of uranium ore. Two property transfers, reported to involve $3,500,000 have been made recently, some involving nationally known financial figures. With capital coming into the district development on a larger scale than in the past may be expected. Heretofore much of the operation has been on a limited scale and the mines have been financed largely out of their own production.

Problems of the American and European Coal Industries

The very real problems facing the coal mining industries of the United States and Europe could in each case be solved most effectively by increased productivity, notwithstanding the fact that the problems of each continent differ economically. In the following article our Coal Correspondent indicates these problems and explains the reasons for their existence, while at the same time describing the measures being taken to eliminate them as far as possible.

The growing preference for liquid and gaseous fuels in North America is causing a decline in the demand for coal and it is predicted that during the next few years the coal industry in the United States and Canada will have to cut down total production to avoid excessive competition. Mining costs will also have to be reduced if coal is to be sold at a price which will enable it to hold its own against oil and natural gas. In Western Europe, on the other hand, the demand for coal is increasing and the immediate need is for greater total production. Although the problems in Europe and North America differ economically, they could be solved most effectively by increased productivity in the mines; and technological developments on both sides of the Atlantic are being directed to this end.

DEVELOPMENT OF NEW TECHNIQUES

The efficiency of the traditional methods of coal mining in the United States is, by European standards, very high, but even so coal is being displaced by oil and natural gas except in some fields of application, such as the generation of power in central stations and the manufacture of metallurgical coke. American mining engineers are therefore turning their attention to new techniques based on the use of machines of the continuous miner type, which not only yield high outputs per manshift at the face, but also enable production to be concentrated within smaller areas.

The number of continuous miners in use in the United States at the end of last year was 300 compared with 175 at the end of 1952. These machines produce from 16 to 50 tons of coal per manshift at the face and in many instances the underground transport systems have been unable to cope with such large outputs from individual faces. A conveyor from the face to the surface is the logical answer to this problem but this is not always feasible in the older mines, where the transfer of coal to mine cars at the haulage terminals is unavoidable. The difficulty then is to provide sufficient storage capacity at the loading points to enable the flow of coal from the face to go on without interruption, particularly since bunkers holding up to 300 tons are sometimes required for this purpose.

The room, or roadway conveyors used with continuous miners may be of the extensible belt type or the scraper chain type. The problem of keeping the face end of the latter up with the machine is usually solved by using a mobile intermediate conveyor, sometimes referred to as a bridge conveyor, between the machine and the roadway conveyor, into which the coal is discharged at a point well to the rear so as to leave its front end free to enable additional sections to be fitted on to it as the face advances.

The concentration of production to a few working places involves the risk of serious losses in the event of a breakdown anywhere along the line of communications and for this reason few mineowners have so far felt inclined to commit themselves entirely to this system of mining. It is believed, however, that most new mines in the future will be planned from the outset for continuous mining with transport by conveyors from face to surface.

The useful life of a large number of strip mines has been greatly extended by the introduction of the auger, which enables coal to be extracted at a distance of about 200 ft. beyond the point at which it becomes uneconomical to remove the overburden. This may account for the fact that whilst the total production of bituminous coal in the United States last year fell to 450,000,000 tons from 466,840,000 tons in 1952, the output from opencast mines increased from 108,773,000 tons to 112,500,000 tons. Experiments were carried out last year with continuous miners instead of augers. These machines, like the augers, are controlled automatically from the outside, but the cutting heads are kept under observation from side openings driven through at regular intervals from the adjacent worked-out heading. This makes it possible for the machine to penetrate about twice as far as the auger and distances up to 350 ft. have been reached in this way with up to 70 per cent extraction.

The unceasing evolution of new machinery is straining the financial resources of many mining companies who cannot afford to scrap expensive equipment every time something new turns up, therefore much ingenuity is being shown in the adaptation of old machines to new purposes. Joy loaders, for example, are being converted into continuous miners by removing the claws and fitting hydraulically controlled cutting heads on the front ends of the machines whilst the other parts are retained to perform their original functions of loading out the broken coal on to trailing conveyors. Again, since the tendency now is to use trackless equipment, many cutters, loaders and shuttle cars originally mounted on caterpillar tracks are being fitted with rubber tyred wheels.

COAL PLAN FOR EUROPE

The principal events in the coal industry in the United Kingdom during 1953 were summarized in our issue of January 29. There have been no significant changes in the main objectives of the National Coal Board as set out in the Plan for Coal and technological developments are more or less following the lines indicated in the Plan. The plans of the High Authority of the European Coal and Steel Community, on the other hand, are still in the making since that body has only been in action for about eighteen months. Many political, economic and financial questions have to be settled before detailed plans for technological developments in the mines can be formulated but the immediate aims are :

1. to concentrate production in fewer mines, and to raise productivity in these mines from 1.4 to 1.5 tons per manshift underground;
2. to transfer miners from the least productive areas to these mines and to rehouse them;
3. to increase the production of coking coals by 10,000,000 tons a year;
4. to extend and modernize steam power stations at the collieries to utilize low-grade coal.

The total production of coal within the Community last year was a little less than 240,000,000 tons and consumption amounted to 247,000,000 tons. At the current rate of investment in the industry it is expected that production will be increased to 265,000,000 tons a year within four years.

EUROPEAN MINING—II

Exploitation of Southern European Mineral Resources

Mining development in six countries of Southern Europe is reviewed in a United Nations report entitled *Economic Survey of Europe in 1953*. In the initial instalment of this article the pattern of development outlined in this survey was broadly traced and attention was drawn to recent trends towards increased activity by the State. In the final portion of the article, appearing below, consideration is given to some of the problems involved in the more effective exploitation of mineral resources.

In all Southern European countries research lags considerably behind the standard reached in Western Europe. Even such a basic prerequisite for geological prospecting proper as topographical maps of reasonable size is lacking. Even in Italy there are a number of regions where direct topographical mapping at 1:25,000 has not yet been completed. With regard to geological maps proper, the situation is strikingly bad. For Turkey, a geological map covering the whole country has been made on the scale of 1:800,000 only. In Portugal, the scale of the major geological map so far available is 1:500,000, and this map dates back to 1899.

POSSIBILITIES OF FURTHER RESEARCH

While the state of mineral research and exploration in general cannot easily be assessed, it is possible to point to some cases where further research may have far-reaching effects. In Italy, for example, scientific research has recently led to new hypotheses on the formation of sulphur deposits, which would seem to provide new hints for the discovery of virgin deposits, in place of the empirical (and generally unsuccessful) method of digging holes around the old deposits. It also appears likely that explorations already in progress will in a not too distant future clear up the question of availabilities of hydrocarbons and geothermic energy in Southern Italy.

The known mineral reserves of Southern European countries are set out in the accompanying table. The figures given should be studied, however, with due regard to deficiencies in research and prospecting. In recent years very important new discoveries have been made, such as the hydrocarbons in Yugoslavia or the iron ore of Moncorvo in Portugal, and from Turkey there are frequent reports about the discovery of additional deposits of ores or coal. With intensified and modernized research there is every reason to expect revolutionary changes in the estimated resources.

It is concluded that Southern Europe's foremost requirement for progress in the field of mining is intensified search for mineral reserves. All experience points to the existence of very great possibilities of further discovery. Much time has been wasted through separate prospectors having to find out independently the same thing. Firms seeking one kind of deposit frequently find information which, if pooled, could be useful to others with different objectives. It is thus desirable that Governments should take measures to secure the pooling of all information resulting from private research and exploration.

A second and still more important question is the scope that should be given, respectively, to public and private research and prospecting. Clearly, topographical mapping and country wide geological surveys, as well as other geological, physical and chemical research relating to mining, belong by their very nature to the field of public responsibility. As to prospecting itself, it is considered that the attention of public authorities should be concentrated in those fields where the returns on the efforts invested are too remote or too "diffuse" (in the sense of benefiting the community at large as well as the investor himself), or where the capital required is too huge to attract private initiative.

Southern European governments have recognized, though in varying measures, the need for public initiative in the field of mining. They all seem to have some kind of general mining administration, mainly with a co-ordinating function, but in some cases also taking an active part in the development of the industry. Turkey has built up, in the last seventeen years, a Government institute (M.T.A.) which carries on all the different stages of research and exploration. In Greece, a public institute for the geological exploration of the country exists, but its annual budget is only the equivalent of $50,000—a remarkably small amount for a country believed to be rich in minerals and where geological prospecting has hardly begun. Some countries have set up Government-sponsored syndicates which co-ordinate a group of mining enterprises and, *inter alia*, pool their activities. Examples are to be found in Italy and Spain.

MINING EXPLOITATION

Several circumstances make the undertaking of actual mining operations more problematic in southern than in most other European countries. In the first place, capital, especially of a risk-willing nature, and administrative and technical ability are scarce. Secondly, the supply of adequately trained labour often presents difficult problems. Thirdly, transport difficulties often prove a hindrance to the exploitation of otherwise economic mines. Fourthly, there are the problems arising from the fact that Southern European countries have tended to be "technique-followers" rather than "technique-leaders."

The success of any particular branch of mining, it is suggested, depends closely on the integrated development of

KNOWN MINERAL RESERVES OF SOUTHERN EUROPEAN COUNTRIES
(000,000's of tons)

	HARD COAL	IRON ORE‡	LEAD§	ZINC§	COPPER§	PYRITES	BAUXITE§	CHROMITE§	FLUORSPAR *a*	MANGANESE§	ANTIMONY§	TUNGSTEN *b*	MERCURY *c*	POTASH *d*	OTHER IMPORTANT RESERVES
TURKEY	400	12	NA	NA	5	NA	NA	7·8	NA	4·8	NA	NA	NA	NA	Lignite, magnesite, gold, silver, emery, oil
GREECE	NA	57	0·12	0·15	NA	2·5	15	2	NA	0·22	NA†	NA	NA	NA	Lignite, nickel, baryte, molybdenum, magnesite, emery
YUGOSLAVIA	39	198	NA	NA	0·75	NA	26	12	NA	0·15	0·05/0·08	NA	0·7	NA	Lignite, asbestos, magnesite, oil, molybdenum
S. ITALY*	600/700	15/20	0·27	0·62	NA	NA	5	NA	NA	0·46	NA	NA	NA	NA	Oil
SPAIN	8,000	630	1·09	1·0	4·5	273	NA	NA	2·72	NA	NA	0·59	1·0	270/500	Lignite, magnesite, tin Cassiterite, asbestos
PORTUGAL	20	22	0·01	0·01	NA	7	NA	NA	NA	2·54	NA	1·09	NA	NA	

* Including Sicily and Sardinia † Possibly large ‡ Iron content § Metal content *a* Ore up to 35% Ca F_2 *b* WO_3 content *c* Millions flasks
d A_2O content NA No figures of reserves available

all the industrial stages through which the mineral has to pass. Therefore, in countries where the industrial structure is relatively little developed, better results may be expected from concentrating investment on the creation of comparatively self-contained branches of production than by spreading it over many different types of mining. Such considerations seem to have been important in recent government-assisted production plans in Greece.

Despite the general excess of manpower in agriculture, manpower shortage is no less widespread and chronic a feature of mining in Southern Europe than in other European countries. The shortage of labour may appear as a problem of absenteeism and rapid turnover.

Higher wages are part, but probably only a minor part, of the solution. In order to attract and hold manpower and develop it into an efficient and stable mining population, all-round community planning is necessary. It can be all the more successful if such communities are made into integrated industrial centres by bringing processing or consuming industries to the pit-head. Transport costs may be reduced very considerably by refining the material at the pithead. If a given investment appears unprofitable through lack of traffic, it is possible that both investments might appear profitable if undertaken simultaneously. The last decades in Turkish mining and railway policy provide examples of the realization of "external economies" in this sense. Spain, on the other hand, seems to provide some typical instances where similar possibilities still await exploitation.

IMPORTANCE OF EVALUATION TECHNIQUES

The fact that so wide a range of Southern European mineral reserves are at present classified as uneconomic may be imputed partly to their being evaluated with reference to imported techniques. A readaptation of technical outlook, processes and equipment is therefore needed to widen the range of possible lines of development in Southern Europe. A good example of the scope for technical flexibility is the attempt made in Spain during the war to use indigenous bauxite, hitherto considered unfit for use in aluminium. An important problem still to be solved is the use of the sulphurous/ferrous ores found in several southern European countries. Autonomous experimentation, and eventually the spreading of new patterns of end uses, should be regarded as a major element in southern European mining policy.

The authors of the report conclude that, where the choice exists, there is a strong case for developing mining principally as a source of raw materials for home industries. With the possible exception of bauxite, however, the products which are most promising as export items tend to be those which are unlikely to provide starting points for industrial developments at home. In fact, southern European countries could produce a handsome list of minerals for which a continued keen export demand exists. For example, the Paley Report lists the following strategic requirements: chrome from Turkey, wolfram from Spain and Portugal, bauxite from Yugoslavia and Greece, sulphur from Italy and Portugal, fluorspar from Spain and Italy, and mercury from these two countries and Yugoslavia.

The question of developing exports of these products is closely bound up with that of attracting foreign capital. Both Turkey and Greece have recently drafted new laws intended to attract foreign capital, not least for mining enterprise. There is much to be said for reserving for foreign capital these mining opportunities which are interesting only for export in raw or crudely processed form, while concentrating the scarce domestic capital resources available on mining projects which are more directly related to the building up of a balanced industrial structure.

Faulting in the O.F.S.

***Optima*, the quarterly review published by the Anglo American Corporation of South Africa, has already established itself as one of the mining industry's more serious and authoritative periodicals. The March issue, which is published this week, has two things in particular to commend it. First, the cover, which in the past must have discouraged many a prospective reader from looking further, has been redesigned and, typographically, now has an altogether more inviting appearance. Secondly, the issue contains a notable article by Dr. B. B. Brock, joint consulting geologist to the Anglo American Corporation, entitled "A View of Faulting in the Orange Free State." *The Mining Journal* has invited Dr. G. A. Schnellmann to contribute the following appraisal of Dr. Brocks' analysis and conclusions.**

While investors and speculators may well be content to accept the Rand and the O.F.S. goldfields as facts, and be grateful for them, they are phenomena which entail a great many problems both of an engineering and of a scientific nature. The solution of mining problems in general depends very largely on a correct appraisal of the geological structure of the ore deposit concerned, and it is significant of the increasing recognition of this truth that whereas the Rand (an essentially simple geological structure) found little use for a mine geological department during the first several decades of its life, the O.F.S. has found such an organization essential from its birth. Each of the seven mines in the group discussed has a senior and junior geologist, and foresees the necessity of increasing this number.

Dr. Brock seeks to explain why, and achieves this object with a combination of accuracy and lucidity rare in an article intended partially at least for the layman. He commences with a well-reasoned explanation of the formation of the Witwatersrand basin and its subsequent deformation, while being careful to point out that the data are incomplete and that other interpretations of the fragmentary evidence are not only possible, but are in fact held by competent geologists. The main fact which emerges from this is the initial unity of what now, by accidents of faulting and erosion, are separate goldfields. He is on less controversial ground in his explanation, beautifully amplified by block diagrams, of the nature and effects of faulting. This is the essential stock-in-trade of the geologist, whose particular job in these circumstances is the reverse, that is to say, to re-establish the continuity and so enable the mining engineer to plan his development and mine lay-out.

Dr. Brock rightly points out the difficulties and, indeed, the limitations of the process and dispels the belief (not held, incidentally, by geologists) that there is any wizardry in this business of locating ore. He makes a consoling point which O.F.S. shareholders should bear in mind as they receive development reports: faulting gives rise to loss of ground and other mining difficulties, but if there had been no faulting, there would be no O.F.S. goldfield.

Death of F. H. Brownell

The death has occurred in New York of Mr. F. H. Brownell, chairman of the Board of the American Smelting and Refining Company from 1930 until his retirement in 1947. He was 86.

Originally educated as a lawyer, Mr. Brownell was a former president of the Washington State Bar Association, before becoming General Counsel of the American Smelting and Refining Company in 1916. He later became a vice-president and was appointed chairman of the company's Finance Committee in 1919 and in addition held other executive positions.

He took a prominent part in the controversies regarding U.S. policy in regard to the monetary metals, especially the need of metallic backing for the national currencies, and several articles by him appeared in *The Mining Journal*.

Mining and The Royal Society of Arts

This week the Royal Society of Arts is celebrating the two-hundredth anniversary of its formation. On such an occasion it is appropriate to recall that in the course of its long and fruitful existence, it has made important contributions to the mining industry.

In 1753 a Northampton drawing-master, William Shipley, published proposals "for raising by subscription a fund to be distributed in Premiums for the promotion of improvements to the Liberal Arts and Sciences, Manufactures, etc." Failing to obtain support for his scheme locally, Shipley went to London and succeeded in interesting a few prominent men. A meeting was held on March 22, 1754, at which it was decided to found a "society for the encouragement of arts, manufactures and commerce in Great Britain."

EVERY INTEREST IN MINING

The Society's interest in mining and minerals goes back to its earliest days, for its first concern was with two raw materials, cobalt and madder, which had to be imported into Britain at considerable expense. Cobalt ore was required for the production of its silicates, zaffre and smalt, which impart a beautiful blue to glass. As Shipley reported to the Society at its second meeting, over 200,000 lb. of smalt was imported into this country in 1753, so that to open up a source of this material in Britain would be well worthwhile. It was decided to launch the Society's programme by making four offers, one of which was £30 for the best quality of cobalt (not less than £20) produced in Britain.

The Society received samples from several localities and made an award in 1755 to Mr. Beauchamp, of Truro, but no mine was ever put into operation. A major difficulty was that, though this material had been found in Cornwall and was considered likely to occur elsewhere in Britain, the deposits would probably be too small or too uncertain in quality to make the opening up of mines for cobalt only an economic proposition.

While the Society's objective was not directly attained, the attempt to foster cobalt mines had interesting consequences. Specimens submitted by applicants for awards were at first sent to the Assay Master, but the Mint was unable to undertake the task of assaying them, because the equipment and experience available were limited to the assaying of gold and silver. Various chemists within the Society therefore coped with the problem in their own private laboratories. This experience showed very clearly the need for a central laboratory to which members of the public who found promising looking minerals might send them for analysis. Furnaces were therefore installed early in 1757 in the kitchens of the Society's offices, similar arrangements being made in the new quarters to which the Society moved in 1759.

Owing to the general ignorance in Britain on the subject of cobalt, the Society's promotion of this metal also led to its first international venture. In 1756 it was decided to offer a gold medal for an essay describing how cobalt might be expected to occur geologically, how it might be identified and assayed, and how zaffre and smalt should be made from it.

The Society also offered awards for the discovery of various ores, including manganese (found in 1804 by Dr. Dyce near Aberdeen) and chrome-ironstone (found by Dr. Hibberd in Shetland in 1820). An offer which it began to make in 1765 for crucibles for assaying tin ore appears to have contributed to the revival of Cornish tin mining and nearly 20 years later a gold medal was awarded to George Unwin for reviving the export of tin to India and China.

One of the Society's most valuable contributions to minerals development was by encouraging a survey of the whole of Britain's mineralogical resources. In 1802, it began to offer three gold medals for mineralogical maps of England and Wales, Scotland and Ireland, respectively, on a scale of not less than ten miles to the inch. The most notable award was that made in 1815 to the "father of British Geology," William Smith, for his mineralogical map of England and Wales on a scale of five miles to the inch. This prize enabled Smith, a poor man, to publish his map, which was the first of its kind. Thereafter the Society offered prizes for inch-to-the-mile mineralogical maps, but these were never claimed.

Another direction in which the Society was able to assist the mining industry was by fostering various developments in pumping and ventilation. For example, William Westgarth received a bounty of 50 guineas for his hydraulic pumping unit, which was already being used in the Cornish tin mines. In this engine a downward flowing column of water pressing the piston of one cylinder was made to operate a pump which forced another column upwards. A gold medal and 100 guineas was awarded in 1816 to James Ryan for a ventilating system, which consisted of "passages of gas drifts" so arranged as to collect and draw off the gas at the highest level.

In the Society's *Transactions*, 1907, appears a description of a method invented by Gilbert Gilpin for raising coal and ore from mines by means of chains working in grooves formed by folding wooden barrels spirally, with a wrought iron tyre, so as to leave a vacancy between each fold for the lower part of the circumferences of those links of the chains which worked vertically to move in, and thereby caused uniformity and safety in motions. T. W. and B. Botfield, of the Old Park Ironworks, testified that they had four of these machines at work on their mines, one with a cylindrical barrel and three formed of the frustrums of cones, "which machines are (to the best of our knowledge) superior to any hitherto known or in use, and will produce the effect at much less expense."

PROMINENCE IN SAFETY ENGINEERING

In the field of safety the Society is again prominent. The first person to provide miners with fairly good and safe light was Dr. Clanny, of Bishop Wearmouth, who devised various forms of lamps into which air was forced by a bellows, its exit being controlled by valves. He received both a silver and a gold medal from the Society, but his devices, though valuable and practical, were soon superseded by the safety lamps of Davy and Stephenson.

A large silver medal and 50 guineas were awarded in 1825 to John Roberts, for a device embodying all the principles of the modern gas mask. It was invented by Roberts to protect himself against the hot and acrid fumes of the great fires which used to burn at the foot of pit shafts to induce ventilation of the mine, and consisted of a goggled leather hood, completely covering the head and face, with an air inlet containing flannel to catch the solid matter in the smoke, and a wet sponge to dissolve the poisonous gases.

The Society still remains keenly interested in mining progress. It is noteworthy that "Improving Coal Production" was the subject of the Cadman Memorial Lecture delivered on February 25, 1953, by Mr. E. H. Browne, Director General of Production, National Coal Board, while as recently as last week Mr. R. W. Willett, Commonwealth Liaison Officer in London, read a paper on "Mineral Resources of the British Commonwealth: Some Recent Developments."

Some Engineering Features in Modern Ore Dressing and Smelting Practice

By C. C. DOWNIE

The equipment utilized in ore dressing and extraction metallurgy has been the subject of rapid development during recent years, and many facets of design and construction have been improved upon or enlarged in scope. The following article outlines the dimensions and capacities of certain of the units used at the present time in ore dressing plants and in smelteries, and indicates their practical application in conjunction with other relevant equipments.

The power aspects of ore dressing equipment have been given special attention in recent years, besides that of the initial prime movers. The crushing and pulverizing equipment has been augmented by exceptionally large designs of jaw crushers, which in many cases permit the largest blocks produced in the ore mine to be reduced to a size suitable for smelting directly.

For example, large boulders handled by one machine produce forces which can be taken up only by a steel construction of extremely strong disposition. The crusher will take boulders of ore up to 10 tons in weight and crush them down to the size of a football, where, between the two jaws, a top-opening is left which is 7¼ ft. in length and 5¼ ft. in width. The output is from 500 to 800 tons per hour of uninterrupted service, while the contents of a 20 ton car can be dealt with in a matter of from 1½ to 2 minutes.

OVERALL DIMENSIONS

Regarding the overall dimensions of the machine, which are somewhat unusual, the height is 17 ft., the length 21 ft., and the width 20 ft.; some 15 railway trucks are required to transport it by rail, and it represents one of the heaviest crushers constructed. The weight of the complete crusher amounts to 235 tons, where each of the two flywheels of 10¼ ft. diameter has a weight of 13 tons, while the heaviest individual component is the swinging jaw which weighs 40 tons.[1]

Reference is also made to hammer mills for pulverizing ores and charges to be made up in the form of briquettes, in which the beaters are made of selected manganese steel which combines hardness and uniform toughness, whereby in spite of the heavy pounding they are subjected to, these parts enjoy a lengthy life. These beaters, which disintegrate the material through blows, are linked to a revolving spider. They are attached in such a manner that they can give way if necessary, and may be conveniently turned about or replaced when worn on one edge, while to prevent clogging, provision is made for opening and closing the discharge grids during operation. There is no need to remove the rotor to replace the beaters, which only require the removal of a few bolts. Mills of this kind can handle upwards of 100 tons of ore per hour depending on its hardness, while 150 tons per hour can be handled by centrifugal mills with two cages comprising a number of bars, and running in opposite directions, to rapidly disintegrate the material.

Fitted with cage diameters of 95 in., such mills can deal with ore charge briquetting for blast furnace smelting which formerly required a set of pan mills.[2] In one nickel smeltery, a battery of pan mills, each equipped with its individual bucket-elevator arrangement for feeding the briquetting machines, occupied much space and additional labour, which are superfluous with the modern hammer mill.

Regarding the ore dressing plant proper, and with regard to the choice of motors, consideration must be given to the fact that the chains of elevators and trough conveyors are relatively delicate, and that the smaller types have sufficiently strong chains to withstand the starting torque of squirrel-cage motors. Alternatively, with large elevators of 25 to 30 kW. upwards, the comparatively high starting torque can cause excessive stresses on the chain, particularly when the rating of the motor has been calculated with a good margin, and when starting produces a certain degree of jerking.

On the Continent, double-cage motors with Kusa starting are recommended in order to protect the chain. In one ore dressing plant, totally enclosed squirrel cage motors with surface cooling are used to drive the elevators, each with a rating of 11 kW. and 1,500 r.p.m. The choice of motors for screens and grids presents no difficulties, and the same class of motor as the foregoing, but with a rating of 6.5 kW. and 1,000 r.p.m., suffices. For certain kinds of sifters, however, such as riddles and swing sieves, which require a greater starting torque, the rating must be calculated on the high side, as the lack of balance can cause vibration, and the motor must be mounted on the same base, and also be of the mechanically reinforced type. With Merz screens, the drives may be mounted on the frame of the screens, and be subjected to the same oscillations, since from 300 to 350 vibrations per minute, with a range of 20 to 30 mm., can impose severe strains on the motor, and in which cases mechanical strengthening of the design is imperative.[3]

VARIATIONS IN MOTOR RATING

Great variation in the demands on the motor arises in the working process of grinders, breakers and crusher rolls, and which is particualrly so where a fully loaded machine stops and must be again started up. The squirrel cage motor is usually most suitable, and its rating should be fairly high in view of the load variations, so that it develops from 1.6 to 1.7 times the normal full-load torque of the pulverizer when started up, whereby slight obstructions are overcome. In the same ore dressing plant as where the elevators and screens are used, these squirrel cage motors, with a rating of 45 kW. and 1,000 r.p.m. are used for driving the jaw crusher, and a rating of 120 kW. and 1,500 r.p.m. for driving the ball mill. While it is possible to use the double-cage motor in conjunction with the starting system mentioned for machines which perform the roughest work, such as jaw-crushers, it is but rarely that any advantage is gained by the 2.5-fold starting torque developed by this motor in the second step. Where the clogging is so severe that it cannot be overcome by the 1.7 torque of the oversize squirrel cage motor, the 2.5 torque of the double squirrel cage motor will likewise not suffice. Consequently the crusher must be cleared, and where possible is always best driven through a belt, thus forming a flexible link in view of its rough operation.

Jigs, pumps and exhausters, flotations and filters, do not require a particularly great starting torque, and do not make special demands on their driving motors. Squirrel cage motors for driving normal plate filters are rated at 5.5 kW. and 1,500 r.p.m. whereas concentrating tables are best served by totally enclosed three-phase shunt-characteristic motors with speed regulation and surface cooling, normally rated at 1.2 to 3.6 kW. and 600 to 2,000 r.p.m.[4]

CONCENTRATING AND BRIQUETTING PLANT

Concentrating tables should have drives which can be regulated, and the frequency of oscillation of the table must be exactly adjusted to the feed and the grain of the material handled.

Irrespective of possible fluctuations of load, the frequency, once set, should be rigidly adhered to, and this again can only be properly effected with a shunt characteristic motor, which is usually of the three-phase type. With what is termed the " resonant " type of swing sieve, exact adjustment of speed is necessary, as it is only at one definite speed that the most favourable resonance is attained. Should this adjustment be effected by regulating the motor, load fluctuations must not be allowed to cause any variation in speed, and the last-mentioned motor is again used with advantage.

AUXILIARY BRIQUETTING EQUIPMENT

Regarding the auxiliary equipment for briquetting plant, slip-ring motors are still used in the older smelteries for drying machines, but it has to be observed that their series characteristics render these drives unsuitable for the conditions of service which materialize. Under variations of load, they do not allow a definite reduced speed to be maintained, and in addition, owing to the high starting torque necessary, these motors must have a high reserve rating. They are particularly susceptible to load variations, and under normal conditions are run at appreciably reduced loads.

Frequently it is impossible to get down to the lowest speed, or to maintain it during load fluctuations, in spite of the most careful proportioning of the regulating resistances. It is of decisive importance that ores and residues which are to be made into briquettes be evenly dried to the correct moisture percentage, and the motors for which must therefore allow of fine speed adjustment down to some fifty per cent of normal with constant torque, and irrespective of load variations to maintain the set speed. Demands of this kind can only be met by motors with shunt characteristics, and the speed of three-phase shunt-characteristic motors is literally constant under all load variations.

The slip-ring motor alters its speed when the load fluctuates, owing to its tendency towards a series characteristic, and hence only the former motors can be used, as it is essential for the speed to be constant. For dryers, and particularly tubular dryers, the motors must be designed for a high starting torque, as the condensation of the steam during intervals in operation means that exceptionally large masses have subsequently to be accelerated. It is therefore necessary to have a starting torque of 3 to 4 times full load torque, and the three-phase shunt characteristic motor again fulfils this condition.[5]

APPLICATIONS TO DIFFERENT SMELTERIES

A review of activities in the nickel smeltery reveals the importance of systematic briquetting practice in handling nickel ores, cobalt ores, and the more complex high chromium-bearing ores, but the same methods have been found necessary with certain of the poorer mixed copper-bearing ores. Much of the dressing treatment is superfluous with rich copper ores, where the mechanical side more relates to expeditious handling of the material, coke, and fluxes.

In one of the large copper smelteries, in order to avoid having to travel the loading bridges too frequently when filling the different bunker pockets, the ore is first of all discharged into an electrically driven distributor car of 30 tons capacity, with bottom discharge, which travels along an elevated track above the bunker plant. The load is distributed over 20 bunker pockets, and the bunker outlets are equipped with trap doors operated by the driver of the mixture car. The latter is equipped with a weighing device and two turntables for the hopper buckets.

After the matter is prepared in a bucket, the mixture car travels underneath the inclined hoist, picks up the empty receptacle coming from the throat, and sets down the full one, when the operations are repeated. The bridges have double-rail crabs of 12½ tons capacity, the inclined hoist cuts the bunker plant at right-angles, and the lower part of the inclined bridge is so constructed that the crab on the down trip places the trailed empty bucket on the turntable of the mixture car. Each bucket sets itself down on a frame, and does not pass the mixture direct into the copper blast furnace, but lets it drop into a charging car with bottom discharge. This mixture is then transferred by the vehicle into three throat pans of the throat seal, each of which is kept locked in the usual way by a throat-bell.[6]

DRYING OF LEAD ORES

A unique addition to the drying equipment referred to is seen in the drying of lead ores, where the exhaust gases of the diesel engines are passed through the drying drums, although the ore-dressing house is located some 80 ft. away, while the cooling water from the same engines is also engaged for dressing. (The engines for the power generating plant comprise three single-acting 4-cycle diesels, each having an output of 309 b.h.p. and 300 r.p.m. and which engines can be overloaded up to 20 per cent above the normal load, while they are coupled directly with three-phase generators with a rating of 265 kVA., 60 cycles, and 2,300 volts.[7])

POWER IN THE DRESSING PLANT

The allocation of power required in dressing plant is ably demonstrated in the handling of molybdenum ores, where the material has to be passed through a somewhat elaborate treatment of crushing, classifying, and preliminary and final flotation. For the handling of 600 tons of molybdenum ores weekly, the crushing and picking plant requires 20 h.p. for ore crusher, feeder and crushing rolls, 6 h.p. for the three belt conveyors, and 2 h.p. for the vibratory screen. In the grinding and flotation plant, 55 h.p. is necessary for the tube mill, 23 h.p. for two blowers, 4 h.p. for feeder and classifier, 4 h.p. for 6 Callow-McIntosh cells, and 3 h.p. each for the mixer and filter plant, making a total of 120 h.p. required.[8]

REFERENCES

(1) Krupp-Grusonwerke A.G. Berlin.
(2) Krupp-Grusonwerke A.G. Berlin.
(3) Esch-Werke, Duisburg.
(4) Siemens-Schuckertwerke, Berlin.
(5) Siemens, and Demag, Duisburg.
(6) Mansfeld Copper Works, Mansfeld.
(7) M.A.N. Augsburg, and General Electric Company, Schenectady, U.S.A. (for St. Joseph Lead Company).
(8) Le Molybdene Company, Azegour and Paris.

MACHINERY AND EQUIPMENT

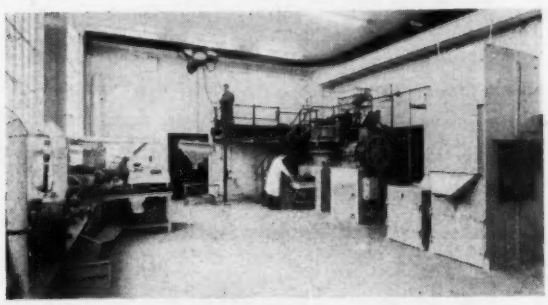
The Bessemer Laboratory

The increasingly important part played by mineral dressing in mining and metallurgical techniques has promoted a demand for thorough training and a high level of skill amongst operating personnel, a point which is fully brought out elsewhere in this issue on page 322. This demand, accentuated both by rapid improvement of metallurgical practice and by the need for high-quality materials to meet the rigid specifications of modern industry, calls for wide and up to the minute training facilities. These will be provided at the Bessemer Laboratory of the Royal School of Mines, which has been reconstructed to allow students to appreciate the full implications of the various processes included in current mineral dressing techniques.

The Bessemer Laboratory is modern in design, and its incorporated equipment comprises prototypes of those units used in present day dressing practice. Several novel features are included in the dry crushing room. The batch crushing machinery is installed on the west wall and includes a Blake jaw crusher manufactured by H. R. Marsden Ltd., a new Symons cone crusher manuactured by Fraser and Chalmers Engineering Works, and an electric vibrating screen and automatic three-stage riffle, both of special design. An old set of crushing rolls is also installed on the west wall, and all the appliances listed which can produce dust are hooded and protected by ducting leading to a wet arrester, the cleaned air being returned to atmosphere. A heated drying floor is built into the room. The foundations for the Blake and Symons crushers, as well as those for the crushing mills, rest on a pad of cork 1 in. thick, and are surrounded by a similar thickness of cork. This installation is for the purpose of reducing vibration and has proved satisfactory.

The wet arrester, at which the dust exhausting terminates, is manufactured by the Sturtevant Engineering Co. Ltd., and the exhaust fan is the manufacturer's No. 1 D type stationary suction fan, 4 ft. 6 in. in diameter and driven by a 5 h.p. electric motor through V-belt drive at 1,440 r.p.m. Power supply is 440 volts alternating current at a periodicity of 50 cycles per sec. on three phase circuit. In addition, a mobile Uniclone equipment, produced by the same manufacturers, can be coupled to any crusher unit to supply dust samples for analysis. By means of the three stage riffle different proportions of representative samples of ore can be separated by the operation of suitable valves.

The patent Mucon valve manufactured by Bell's Asbestos and Engineering Ltd. is used for all connections between the ducting and the crushers to control the flow of granular solids.

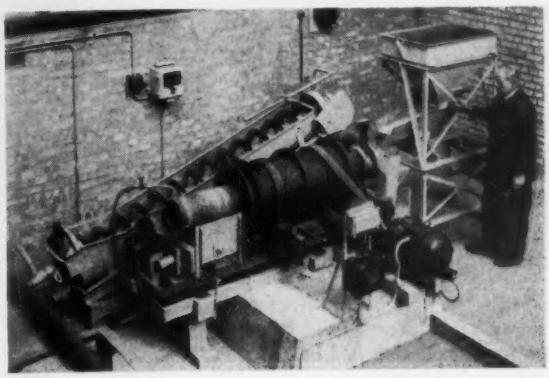


The crushing room of the Bessemer Laboratory showing various equipments. Ore is moved by electric crane and mono-rail

It is particularly suitable for dusty and irregular materials as well as for hygroscopic organic substances. This equipment has a flexible sleeve diaphragm forming a concentric annular orifice which can be varied through 180 deg. of arc.

Amongst the ore sample handling equipment is the travelling carriage for loading the crushers with samples of ore, manufactured by the Riley Stoker Co. Ltd. In this equipment the loading chute is mounted on rails across the frame of the carriage, the chute itself being vibrated by a Syntron feeder. Amplitude varies according to grade and size of ore handled.

A new lecture theatre is situated above the dry crushing room. This is carefully soundproofed, the construction being installed in the ceiling of the crushing room. The theatre can accommodate between 50 and 60 students and is equipped with controlled ventilation, film projection equipment, individually moveable desks and seats, and the usual teaching equipment. Experimental work in not included as part of the lectures.



A small wet grinding mill in closed circuit with Akins Classifier

Lighting is by semi-daylight with fitted screens, so that darkness is not necessary for projection of ordinary work.

The open space of the mezzanine floor and a large part of the floor below it is devoted mainly to pilot plant operation. The mineral dressing department is equipped with a conical ball mill in closed circuit with a rake classifier, and a high to low discharge ball mill in closed circuit with a spiral classifier (as illustrated above). These units may be linked with a jig, unit cell or unit table with a thickening cone to adjust pulp density and to carry out conditioning in the preliminary stage. Either of these units may pump directly to hydraulic classifiers over three differing types of shaking table, in an alternative operation.

Two Lightweight Air Leg Drills

Two new lightweight one-man air leg drills have recently been announced by the manufacturers, Gardner-Denver Company of America. These are the FL 48, which weighs 79 lb. and the FL 58, which weighs 87 lb. These units may be fitted with 24 in., 36 in., 48 in., and 60 in. feed, in all cases hammer diameter of the former model is 2½ in., while that of the latter is 2⅝ in.

The weight of the FL 48 unit, with aluminium alloy feed cylinder, ranges from 80 lb. at 24 in. feed to 89 lb. at 60 in. feed. The FL 58 under the same circumstances weighs from 89 lb. to 98 lb. In all size units feed cylinder O.D. is 2½ in. and feed cylinder I.D. is 2¼ in. Length of the various machines ranges from 51 in. to 88 in. with piston retracted and from 75 in. to 148 in. with piston extended, under conditions appertaining to vertical drilling. The drill steels used are ⅞ in. or 1 in. in diameter.

The air leg is of advanced design. The aluminium alloy cylinder formation gives strength combined with lightness, while a piston rod wiper prevents the encroachment of dirt into the air leg cylinder. Constant blowing from the chuck end prevents water and cuttings from entering the drill.

A Flywheel Synchronous Motor Compressor

The first compressor with a flywheel-type synchronous motor to be installed in the United Kingdom is now running at the Mountain Colliery, South Wales. With this type of motor, the rotor is fixed direct on the extended crankshaft of the compressor, and thus no outer bearings are required and no coupling is needed between motor and compressor. This compressor

ATLAS LOADERS

500 cu. ft. of solid rock an hour

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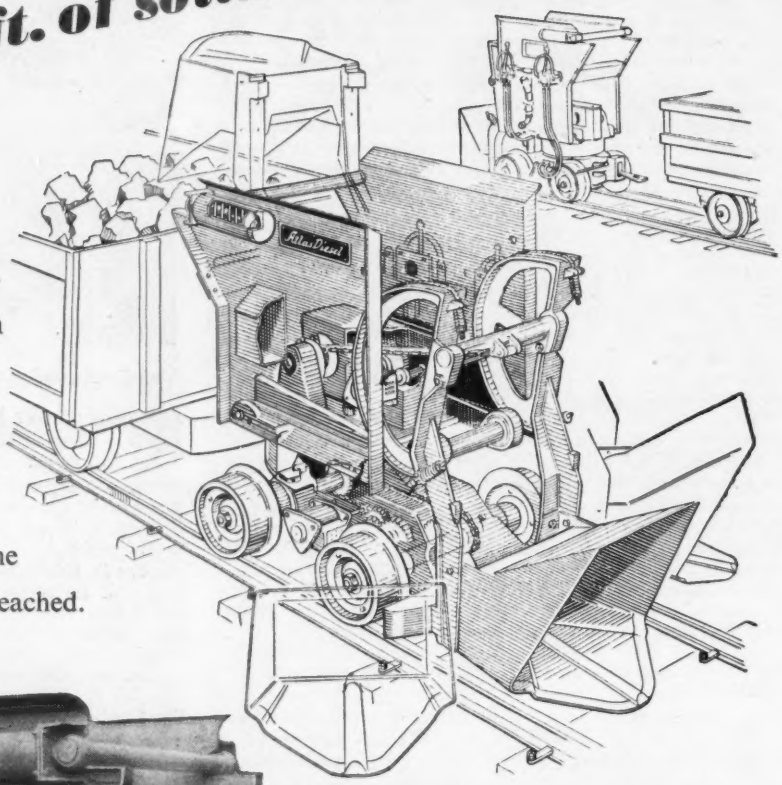
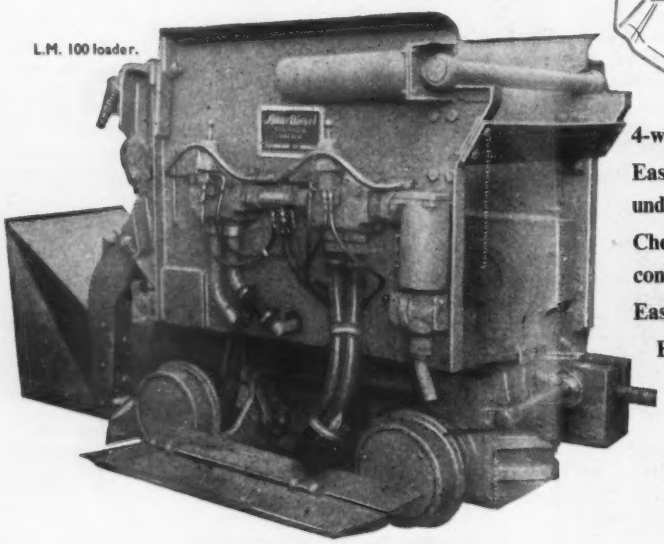
In working capacity, durability and ease of maintenance, they set altogether new standards.

This is mechanical loading at the highest level of efficiency ever reached.



L.M. 100 loader.



4-wheel drive through precision gearing running in oil. Easy to operate. They make loading one of the lightest underground jobs, in terms of human energy expended. Cheap to run. High capacity plus simple robust construction greatly reduce gross cost per ton removed. Easily dismantled for portage through narrow passages. Bucket design facilitates digging in packed material.

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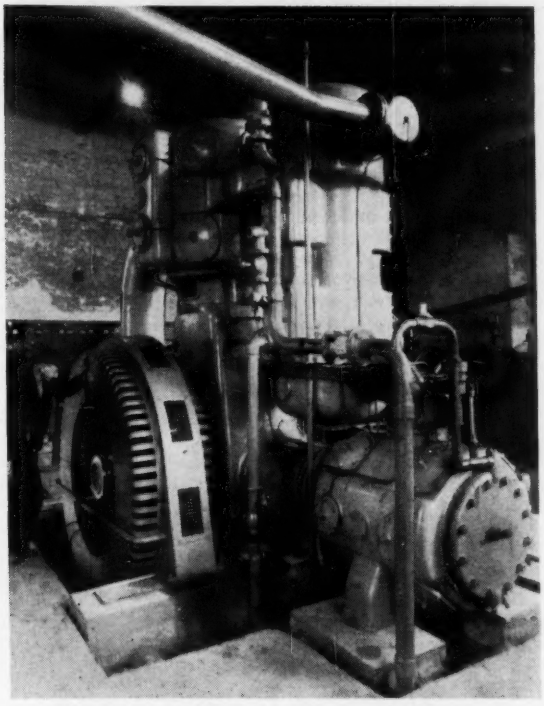
is an AR 9 type manufactured by the Atlas Diesel Company. The A.E.G. synchronous motor has an output of 540 h.p. and a loading power factor of 0.9 with a full load.

As the standard figure in collieries in South Wales is 80 lb. p.s.i. pressure, these compressors have been regulated for that although they have a maximum of 120 lb. p.s.i. The minimum



An Atlas Diesel AR9 compressor installed by the N.C.B. at Mountain Colliery, the first compressor equipped with flywheel type synchronous motor to be installed in the United Kingdom

standard unloading device gauge pressure is 70 lb. p.s.i. Other principal data shows a speed of 300 r.p.m., low pressure piston displacement of 4,020 cu. ft. per min. and a free air delivery at 100 lb. p.s.i. of 3,200 cu. ft. per min.

Ten Atlas AR 9 compressors have been ordered by the National Coal Board. Two are already in use at the Mountain Colliery, near Swansea, another one has been installed in a Welsh colliery ready for operation, four are installed and are soon to be in operation, and the final three have arrived in the United Kingdom. The first compressor at the Mountain Colliery was direct coupled to an auto-synchronous electric motor; the remaining nine will all be equipped with a flywheel-type synchronous motor.

When unloading by means of clearance pockets, the gradual reduction in the capacity of the compressor is effected by special unloading valves being opened and thus putting the cylinder chamber of the compressor into communication with air pockets—clearance pockets—in the cylinder wall. The reduction in the capacity of the compressor results from part of the air being forced during the compression stroke into the clearance pocket instead of being discharged through the delivery valves of the cylinders. Each cylinder chamber has two unloading pockets, which can be connected for either half or full unloading. This device permits unloading the compressor in four steps, full, ¾, ½, and ¼ load. The regulating valve can be so adjusted that a pressure difference of 3 lb. p.s.i. (0.2 kg/cm²), between the various unloading steps is provided. The total pressure difference between full load and no load then amounts to 11 lb. p.s.i. (0.8 kg/cm²). This system of clearance pockets unloading affords the advantage that the load on the bearings and reciprocating parts is balanced during unloading.

A New Chloride Stationery Cell

A large standard sealed-in cell, designated the Chloride GCG10E, has a capacity of 450 Ah. at the 10-hour rate of discharge down to a final voltage of 1.85, and is suitable for operation on all types of circuit whether "floating," trickle charge or straight charge and discharge, according to the manufacturers, Chloride Batteries Ltd.

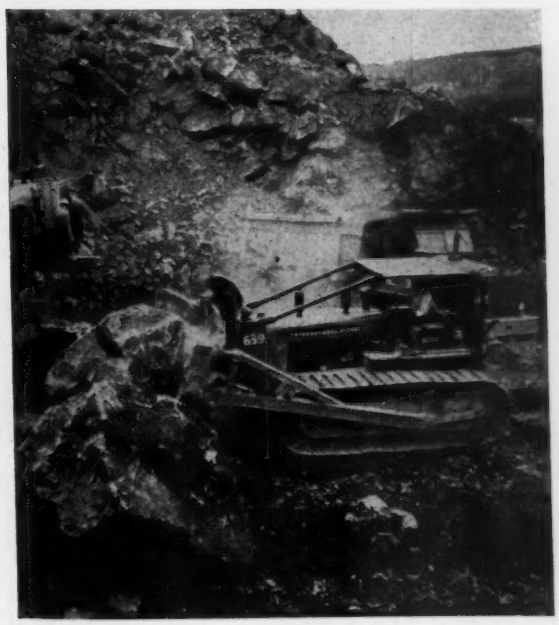
Ten Plante positive plates and eleven box type negatives burned to their respective group bars comprise the elements of the new cell. Each plate is provided with two hanging lugs which rest on the shoulders of the glass box and lead springs are fitted at the end of the elements to prevent the plates from splaying. Flat sheets of Porvic microporous plastic material, each mounted in three slotted dowels of polystyrene, provide the necessary separation between plates of opposite polarity.

Intercell connections consist of lead plated copper straps fixed to the two positive and two negative terminal risers of each cell by lead covered bolts and nuts. The rate recommended for normal charging is 62 amps. reducing to 31 amps. towards the end. With overall dimensions of 10 in. top width and 8½ in. (bottom) by 14$\frac{5}{16}$ in. length by 19½ in. height, the cell weighs 224 lb. complete with approximately 4 galls. of acid.

"After Sales" Service on Crawler Tractors

A special training course was recently conducted for management personnel located in Europe, the Middle East and Africa by International Harvester Company of Great Britain Ltd. The venue was a specially designed training centre near Casablanca, Morocco, where men from affiliate companies and distributor firms studied sales engineering techniques in relation to International crawler tractors, engines and allied equipment.

In addition to normal instructional procedure, motion pictures and slide films emphasized important points in the course, of which one telling the story of the fleet of TD-24 tractors used in the Alcan project in British Columbia was particularly impressive. These units doze such rock fragments



An International D24 and diesel dump truck on a ridge above the Nechako River, British Columbia

as heavy as 20 tons, which are loaded on to diesel dump trucks. The blasts which break the rock use as much as 200 tons of dynamite each.

METALS, MINERALS AND ALLOYS

Aside from lead, the L.M.E. metals have shown strength this week, with tin recording a gain on the week of some £35. It is interesting to see that in the States scrap metal prices have been showing notable inmprovement with lead 1½ c. up from its recent low and copper better at 24 c. In the case of both these metals U.S. consumption of scrap exceeds domestic mine production.

Some dismay appears to be felt in the United States over the unexpectedly large increase in the number of unemployed, computed as either 500,000 or 1,000,000, according to the new or old standards of computation. The figures represent the situation early in February and may improve as the season advances. Anyway, they are serving as an argument in favour of a reduction in taxation.

COPPER.—This week has seen a slight decline in the metal exchange price for copper as shown in our Metal Market report opposite. In the United States the price has gone fractionally firmer, with the export price as high as 30 c.

There is still no news of what is to happen to the Chilean stocks. Opportunity appears to have been taken of the Caracas meeting by the Chilean Foreign Minister, Sr. Barros, to discuss the matter with Mr. Dulles who is reported to have said that his Department had recommended the various Washington agencies concerned to reach decisions as soon as possible. Reports from Bonn say that West Germany is interested in buying Chilean blister to a value of between $5,000,000 and $6,000,000.

The International Nickel Company reports that their output rate of copper was increased last year by some 10,000 s.tons by the end of the year. This increased production is being sold to the U.S. Government under a five-year contract. Inco's total copper deliveries last year were practically unchanged at 117,125 s.tons.

The American Copper Institute's latest figures for refined copper production and stocks are as follows:

	Production			*Stocks*		
	Feb. 1954	*Jan.-Feb.* 1954	*Jan.-Feb.* 1953	*Feb.* 28 1954	*Jan.* 31 1954	*Feb.* 28 1953
U.S.A.	103,496	215,049	209,548	118,417	108,121	60,944
Other countries* ..	70,772	155,872	182,206	275,372	280,510	122,223
World	174,268	370,921	391,754	393,789	388,631	183,167

* Excluding U.S.S.R., Japan, Australia, Norway, Sweden and Yugoslavia.

The discovery of what is believed to be a very large copper deposit some 50 miles south of Alice Springs in the Northern Territory of Australia is reported. According to a member of the syndicate which has been exploring the area, United States geologists have likened the formation to the copper-belt deposits. The National Lead Corporation of America is to develop the area and is expected to begin large-scale drilling shortly.

LEAD.—Lead on the London Metal Exchange suffered some relapse in the early part of the week although United States' prices were quotably unchanged. The Bureau of Mines report on the industry last year gives domestic mine output 335,000 s.tons (the lowest figure since 1935); secondary lead 435,000 s.tons; and imports 554,000 s.tons; making a total supply of 1,325,000 s.tons, 164,000 s.tons less than in 1952 but 137,000 s.tons in excess of consumption estimated at 1,188,000 s.tons.

The St. Joseph Lead Company has joined with other concerns mining lead and zinc in the U.S. in requesting relief "from the flood of unneeded imports." The company's ninetieth annual report notes that imports of these metals slackened in the final quarter of 1953 because of low price levels. "However," it said, "the United States will continue to remain a very desirable market for foreign producers." Upward readjustments in lead and zinc tariffs would in no sense prevent importation of metal required by the U.S., but would result in a sufficient increase in the American price to maintain domestic production at approximately the 1951 level, the report declared.

TIN.—On Friday of last week the metal exchange raised the price of cash tin by £25 per ton to £737 10s. and of three months by £14 to £698 10s., mainly it may be supposed on the announcement that the U.S. had agreed to buy the Indonesian output for the third year in succession. The amount is estimated at between 18,000 and 20,000 tons with deliveries starting in the current month — the deliveries to be approximately in equal quantities of metal and concentrates. Prices will be based on New York market averages. This conclusion of the long drawn out negotiations presumably adds this year's Indonesian output to the U.S. excess supplies of metal to be held "in insulation." During this week London prices eased at first and then firmed up again. Yesterday cash tin was quoted at £740/750.

While the Netherlands, Belgium and the U.K. have acceded to the International Agreement as consumers, France, Germany, Canada and Italy have still to make their decisions known and their support is by no means certain. If these four countries and any one other consumer failed to sign, the agreement could not be ratified. With the possibility that several of the consuming countries may be left outside the agreement, how to bring producing and consuming interests into line will once more be a problem as it was in pre-war days.

A strike is threatened at the Eastern Smelting Company's Penang works. If it materializes, it is to be hoped that the success of the Straits Trading Company in overcoming strike action some three months ago will be repeated at Penang.

CADMIUM.—Despite the cutting down of zinc production last year the U.S. production of cadmium reached the record figure of 4,865 s.tons. Stocks in producers' hands continued to grow and stood at 1,530 s.tons at the end of the year, also a record. Imports of metal were 718 s.tons of which Belgium supplied 74 per cent, Canada 33 per cent, Japan 14 per cent and Australia 10 per cent.

CHROME.—The Electro Metallurgical Division of the Union Carbide announces that the first commercial production of electrolytic chromium has been started at their alloy plant at Marietta, Ohio. The ultimate output should be around 2,000 s.tons yearly. After much experimentation it was decided to utilize high carbon ferro-chrome as the basic material for producing electrolytic chromium. The chief line of consumption is expected to be in the manufacture of chromium-bearing alloys with high temperature applications, especially in the nickel-base and cobalt-base alloys employed in jet aircraft parts.

MAGNESIUM. — The report of the Canadian Dominion Magnesium Limited states that producers in the United States and Europe will have surpluses during the current year and consequently that price will be the governing factor in export markets. The company operates four plants in Canada mainly at Haley in Ontario where dolomite, the raw material, is mined.

The Magnesium Association reports U.S. shipments last year as 17,299 s.tons of castings (17,428 in 1952) and 8,443 s.tons of raw products (9,125 in the previous year).

Austria, which is one of the world's few major producers of magnesite, reports a new record in the production of crude magnesite last year at 792,000 tons (741,600 in 1952). Sintered ore was slightly down at 235,400 tons, caustic improved slightly to 73,200 tons, while magnesite bricks increased to 191,500 tons from a total of 163,400 in 1952.

NICKEL. — The International Nickel Company of Canada estimates that almost 50 per cent of the free world nickel output last year was apportioned to military, atomic energy, and stockpile requirements. The company's report for last year showed that Inco again operated at a peak production rate. Shipments of nickel in all forms amounted to 125,709 s.tons. The annual production rate had been increased at the end of the year by 12,000 s.tons due largely to the perfecting of a new process for the recovery of the metal from pyrrohite. The Soviet Government completed its payment of $20,000,000 for the Petsamo properties in the course of last year.

Concerning the company's outlook, the chairman forecast that "from all present indications for 1954, we confidently expect to operate at full capacity and to sell all the nickel we produce.... We are entering a period when the world will have at its disposal nickel from new producers as well as increased amounts from established producers. In past periods of expanded

capacity, the company energetically sought and developed markets for nickel. It will continue to do so. With all producers contributing to the enlargement of the market the same energy they have demonstrated in developing sources of nickel, it is our belief that there will be profitable use for both the established and the new nickel production."

PLATINUM GROUP.—The price of refined platinum was reduced in the United States on Tuesday by Baker and Company by $5/6 per oz. to $84/87. Baker Platinum reduced its quotation here at the same time by £2 per troy oz. to £30/31, a price corresponding to that to which Johnson, Matthey advanced their quotation last month. The reduction is stated to have been made to enable them to meet competitive quotations in foreign markets. The market here is exceptionally quiet.

Baker and Company have also cut the palladium price by $2/3 per oz. to $21 per oz., the first change for many years. The object of the cut is said to extend the use of the metal.

QUICKSILVER.—Supplies generally are reported to be short here and in the United States due in part it is believed to barter deals between the U.S. Government and the Spanish and Italian producers. Last week the American price was raised to $198/202 per flask.

According to the Department of Commerce figures, imports last year into the U.S. were 85,784 flasks against 68,686 flasks in 1952 while domestic production totalled 14,330 flasks against 12,547. Consumption is put at 52,400 flasks, 23 per cent more than in 1952, but 8 per cent less than in the year previous to that. Last year's increase was due to two new chlorine and caustic soda plants being put into operation. As exports only totalled some 550 flasks, it is possible that a considerable quantity—perhaps as much as 45,000 flasks—has been added to Government stocks.

U.S. imports came principally from Italy with 37,827 flasks (26,026 in 1952), Spain 28,303 (24,333) and Mexico 13,638 (7,971).

TUNGSTEN.—The slightly firmer tendency noticed last week has been maintained and there are more enquiries reported from both sides of the Atlantic.

In our reference here last week to the British Metal Corporation's review of 1953, the date of the earlier comparative prices mentioned should, as readers will doubtless have realized, have read 1938 and not 1948 as printed.

The London Metal Market

(From Our Metal Exchange Correspondent)

Activity in the tin market still continues, and this is helped by the appearance of two diametrically opposed opinions on the probability of the signing of the Tin Agreement. Those who think the Agreement will eventually be signed base their opinion on the benefit to the world of maintaining the economies of the tin-producing countries: those who hold the opposite view appear to base their opinion on the attitude of the French, West German, Italian and Canadian Governments, all of which are reported to be hesitant about signing. In any case, as was pointed out last week, much time must elapse before anything can happen, and although the news of the signing of the Indonesian/American contract for a further year removes some of the surplus production, this still amounts to between 15,000-20,000 tons during the coming year. On Thursday morning the Eastern price was equivalent to £708½ per ton c.i.f. Europe.

The feature of the copper market has been a marked reduction in the backwardation, but this has been largely due to technical factors as demand remains good and producers' selling prices throughout the world are being maintained at previous levels. The forward quotation has shown a tendency to slide back a little, but there have been no signs of any major downward movement. The Chilean situation still remains unresolved, and it will be many weeks before this part of the picture becomes clear enough to form a reasoned opinion on the probable course of the copper price during this year. It is understood that the 10,000 tons which the Chilean authorities said were available for sale in sterling are now being offered to consumers in this country.

The flurry in the lead market was shortlived as consumer demand dried up completely on the rise, and only at to-day's levels has some slight interest begun to reappear. There is a tendency for the backwardation to widen, and this may become a feature before the end of the month unless additional sellers of nearby metal appear. The rise in price in America also frightened consumers, and it would not surprise the market if the price is reduced again to its previous level.

The zinc market has remained unaffected by the fluctuations in the prices of the other three metals, and it appears safe to say that the price will move within very narrow limits for some considerable period, but always with a general upward tendency as the restrictions in ouput begin to have an effect on the size of stocks held by smelters.

	March 11		March 18	
	Buyers	*Sellers*	*Buyers*	*Sellers*
Tin				
Cash	£712½	£715	£740	£750
Three months	£685	£686	£693½	£694
Settlement	£715		£750	
Week's turnover	755 tons		920 tons	
Lead				
Current month	£88	£88½	£87½	£87½
Three months	£87½	£87½	£85½	£86
Week's turnover	6,575 tons		3,950 tons	
Zinc				
Current month	£73½	£74	£73½	£74
Three months	£72½	£73	£72½	£72⅞
Week's turnover	6,450 tons		4,225 tons	
Copper				
Cash	£239	£241	£235½	£236
Three months	£227½	£228½	£225½	£225½
Settlement	£241		£236	
Week's turnover	5,000 tons		5,075 tons	

OTHER LONDON PRICES — MARCH 18

ANTIMONY

English (99%) delivered, 10 cwt. and over .. .. £210 per ton
Crude (70%) .. .. .. £200 per ton
Ore (60% basis) .. .. .. 22s./24s. nom. per unit, c.i.f.

NICKEL

99.5% (home trade) .. .. £483 per ton

OTHER METALS

Aluminium, 99.5%, £156 per ton
Bismuth (min. 4 cwt. lots) 16s. lb.
Cadmium (Empire), 13s. lb.
Chromium, 6s. 5d./7s. 6d. lb.
Cobalt, 20s. lb.
Gold, 248s. f.oz.
Iridium, £55 oz. nom.
Magnesium, 2s. 10½d. lb.
Manganese Metal (96%-98%) £225/£262
Osmiridium, £40 oz. nom.
Osmium, £50 oz. nom.
Palladium, £7 10s. oz.
Platinum, £30/£31
Rhodium, £43 10s. oz.
Ruthenium, £23 oz.
Quicksilver, £69/£70 ex-warehouse
Selenium, 35s. 9d. nom. per lb.
Silver 73¾d. f.oz. spot and f'd.
Tellurium, 15s./16s. lb.

ORES, ALLOYS, ETC.

Bismuth .. .. 50% 7s. 3d. lb. c.i.f.
40% 6s. 3d. lb. c.i.f.
Chrome Ore—
Rhodesian Metallurgical (lumpy) £14 5s. 6d. per ton c.i.f.
" " (concentrates) £14 5s. 6d. per ton c.i.f.
" " Refractory £13 17s. 6d. per ton c.i.f.
Baluchistan Metallurgical .. £15 19s. 6d. per ton c.i.f.
Magnesite, ground calcined .. £26-£27 d/d
Magnesite, Raw .. .. .. £10 - £11 d/d
Molybdenite (85% basis) .. 102s. 4d.-103s. per unit c.i.f.
Wolfram (65%) .. .. .. World buying 107s. 6d. - 112s. 6d. nom.
" " .. .. .. 120s. U.K. Selling
Scheelite (65%) .. .. .. World buying price 102s. 6d. nom.
" " .. .. .. 115s. U.K. Selling
Tungsten Metal Powder (98% Min. W.) .. .. 12s. 3d. nom. per lb. (home)
Ferro-tungsten .. .. .. 9s. 3d. nom. per lb. (home)
Carbide, 4-cwt. lots .. .. £35 13s. 9d. d/d per ton
Ferro-manganese, home .. .. £53 10s. 0d. per ton
Manganese Ore Indian c.i.f. Europe (46%-48%) .. .. .. 7s. 4d. - 7s. 9d. per unit
Brass Wire .. .. 2s. 4½d. per lb. basis
Brass Tubes, solid drawn .. 1s. 8⅝d. per lb. basis

THE MINING MARKETS

(By Our Stock Exchange Correspondent)

Tuesday was the last day of dealing for the old account and closed the financial year 1953/54 for Stock Exchange firms. Despite end of account influences, the market was in good heart, particularly Gilt-edged. The overall revenue position remains better than last year, but budget expenditure estimates for 1954/55 are higher. It is high time that this trend was checked. The main cause of the rise in gilts was renewed rumours of a lower bank rate.

Kaffirs have been quieter and the South African budget is casting its shadow before. Nevertheless, a good surplus is expected and tax cuts hoped for. Finance houses were rather easier, due mainly to lack of interest. Exceptionally, West Witwatersrand improved after favourable mention of its assets value in the press.

Among Rand shares, uranium issues were quiet. No recent developments have taken place to excite the public interest. Blyvoors improved on investment buying following up the West Witwatersrand analysis. Elsewhere, older mines were the main feature. The effect of the improved labour situation, mentioned recently in this column, has been receiving considerable attention and some good buying has resulted.

Late buying in the Orange Free State market failed to offset completely the effects of the shake-out caused by the readjustment of the technical position at the beginning of the week. The market, however, remained steady in the face of the speech by Mr. Richardson, the President of the Chamber of Mines. He stated that the capital invested in this field already amounts to £130,000,000 and that another £80,000,000 would probably be required. St. Helena and Welkom both rose on continued reports of good development.

The West African and West Australian markets showed little change but Sons of Gwalia hardened on special demand. Mount Morgan were quoted ex rights with the new shares at 2s. premium.

In the miscellaneous gold section, the good February figures from Cam and Motor passed unnoticed, but Indian mines were easier on the nationalization threat by the Mysore government.

Diamond shares were unchanged despite the maintained dividend by De Beers and the good figures. Platinums were easier.

Coppers were good. Chartered rose again despite the fact that they were quoted ex dividend, and Nchanga leaped on market rumours that the company had had another very successful year. For the same reason, both Rhodesian Anglo American and Rhokana improved sharply. These rumours are probably justified as the metal price has held up well. Rio Tinto hardened on renewed reports that the company has discovered manganese in Northern Rhodesia.

Eastern tin shares were uneven but many of the leaders showed gains following the higher metal price. This factor can be considered most satisfactory as many mines should be able to show a reasonable profit at a price of over £700 a ton. The market, however, is disposed to be cautious concerning the longer term outlook.

This improvement spread to Nigerian tin, but there were no great changes except in Jantar which had been heavily tipped in the press on account of its small capital and anticipated large profits. The recent lower output figures from Nigeria are probably seasonal and due to the normal dry weather period.

The switch of interest from Kaffirs caused renewed interest and gains in the lead/zinc market but the outlook here must remain uncertain especially for marginal producers.

Elsewhere, Central Provinces Manganese improved on the bonus plans, and Cape Asbestos on reports of the company's spreading interests in mineral fibres.

Canadians hardened with Wall Street after President Eisenhower's statement that any recession would be dealt with by the Government. The good figures from International Nickel received especially favourable attention.

	Price Mar.17	+ or — on week
FINANCE		
African & European	2 3/16	—3/32
Anglo American Corpn.	6 1/16	—1/32
Anglo-French	19/-	.....
Anglo Transvaal Consol.	25/-	.....
Central Mining (£1 shrs.)	28/9	—3d
Consolidated Goldfields	47/9	—1/-
Consol. Mines Selection	29/4½	.....
East Rand Consols	3/1½	—4½d
General Mining	4	—3/32
H.E. Prop	38/9	.....
Henderson's Transvaal	8/-	—3d
Johnnies	48/-	—6d
Rand Mines	3 1/16	.....
Rand Selection	34/4½	—4½d
Strathmore Consol.	32/6	—2/6
Union Corp. (2/6 units)	30/-	—3d
Vereeniging Estates	4½ XD	.....
Writs	33/1½	—7½d
West Wits	40/7½	+1/3
RAND GOLD		
Blyvoors	36/3	+3/3
Brakpan	10/-	+9d
City Deep	18/9	.....
Consol. Main Reef	18/9	.....
Crown	41/10½	+1/3
Daggas	3¾	.....
Doornfontein	26/-	—1/1½
Durban Deep	36/10½	+1/3
E. Daggas	13/9	—3d
E. Geduld .. (4/- units)	30/3	+1/6
E. Rand Props	2 1/16	+1/16
Geduld	4	+1/4
Govt. Areas	13/3	+4½d
Grootvlei	21/6	+9d
Libanon	10/-	—3d
Luipaards Vlei	23/9	.....
Marievale	18/6	+3d
Modderfontein East	13/9	.....
New Kleinfontein	15/7½	.....
New Pioneer	15/3 XR	—1/-
Randfontein	67/6	—6d
Robinson Deep	16/6	+1/3
Rose Deep	14/4½	.....
Simmer & Jack	5/-	+1½d
S.A. Lands	26/3	+1/3
Springs	5/-	—1½d
Stilfontein	27/6	+1/-
Sub Nigel	41/3	+7½d
Van Dyk	5/-	.....
Venterspost	13/3	.....
Vlakfontein	15/3	+6d
Vogelstruisbult	36/9	—6d
West Driefontein	5 1/16	.....
W. Rand Consolidated	2 3/16	.....
Western Reefs	2 3/32	.....
O.F.S.		
Freddies	8/9	—3d
Freddies N.	9/10½	—4½d
Freddies S.	8/10½	—6d
F. S. Geduld	4 1/16	—1/16
Geoffries	14/6	—9d
Harmony	29/4½	—4½d
Loraine	11/9	—7½d
Lydenburg Estates	16/9	—6d
Merriespruit	11/1½	+1½d
Middle Wits	14/4½ XR	—7½d
Ofsits	2 3/16	—3/16
President Brand	50/3	—2/-
President Steyn	31/9	—1/-
St. Helena	24/1½	+9d
Virginia Ord.	13/10½	—4½d
Welkom	21/-	+1/3
Western Holdings	4 1/32	—1/8
WEST AFRICAN GOLD		
Amalgamated Banket	1/6	—1½d
Ariston	5/7½	—1½d
Ashanti	19/4½	—1½d
Bibiani	4/1½	+1½d
Bremang	2/-	—1½d
G.C. Main Reef	3/4½	—1½d
G.C. Selection Trust	6/4½	—1½d
Konongo	2/6	+1½d
Lyndhurst Deep	1/-	.....
Marlu	1/6	.....
Taquah & Abosso	2/6	+1½d
AUSTRALIAN GOLD		
Boulder Perseverance	3/-	.....
Gold Mines of Kalgoorlie	13/6	.....
Great Boulder Prop.	8/4½ XD	—3d
Lake View and Star	14/-	+3d
Mount Morgan	17/6 XR	—1/-
North Kalgurli	6/10½	+1½d
Sons of Gwalia	6/6	+1/-
South Kalgurli	6/6	—3d
Western Mining	11/6	—3d
MISCELLANEOUS GOLD		
Cam and Motor	9/4½	+1½d
Champion Reef	4/6	—1½d
Falcon Mines	7/9	.....
Globe & Phoenix	23/-	.....
G.F. Rhodesian	5/6	.....
London & Rhodesian	4/6	.....
Motapa	2/1½	—½d
Mysore	4/6	—1½d
Nundydroog	5/7½	—1½d
Ooregum	3/6	.....
Oroville	16/7½	—1½d
MISCELLANEOUS GOLD (contd.)		
St. John d'El Rey	19/6	.....
Zams	32/3	.....
DIAMONDS & PLATINUM		
Anglo American Inv.	4 1/16	+1/16
Casts	23/6	.....
Cons. Diam. of S.W.A.	5	.....
De Beers Defd. Bearer	81/9	.....
De Beers Pfd. Bearer	16¾	+½
Pots Platinum	7/9	—4½d
Watervaal	12/6 XD	.....
COPPER		
Chartered	65/9 XD	+6d
Esperanza	7/6	—3d
Indian Copper	4/6	.....
Messina	3¾	—½
Nchanga	7 3/32	+1/32
Rhod. Anglo-American	53/6	+1/3
Rhod. Katanga	14/-	—3d
Rhodesian Selection	15/6	+6d
Rhokana	19½	+½
Rio Tinto	23	+½
Roan Antelope	15/3	+1½d
Selection Trust	37/-	+1½d
Tanks	62/3	+6d
Tharsis Sulphur Br.	51/3	.....
TIN (Eastern)		
Ayer Hitam	25/- XD	—9d
Gopeng	8/3	—3d
Hongkong	7/-	+3d
Ipoh	16/3	+9d
Kamunting	8/3	—3d
Kepong Dredging	5/-	+3d
Kinta Tin Mines	10/3 XD	—6d
Malayan Dredging	26/6 XD	.....
Pahang	13/6	.....
Pengkalen	7/6	—1½d
Petaling	8/-	—4½d
Rambutan	13/-	.....
Siamese Tin	8/1½	.....
Southern Kinta	15/7½	+7½d
S. Malayan	24/6 XD	—6d
S. Tronoh	8/9	+6d
Sungei Kinta	11/-	+6d
Tekka Taiping	5/9	+3d
Tronoh	22/6 XD	—6d
TIN (Nigerian and Miscellaneous)		
Amalgamated Tin	14/6	—1½d
Beralt Tin	21/6	+1/6
Bisichi	6/3	+1½d
British Tin Inv.	14/6	+4½d
Ex-Lands Nigeria	3/-	+1½d
TIN (Nigerian and Miscellaneous) contd.		
Geevor Tin	11/-	+3d
Gold & Base Metal	3/7½	.....
Jantar Nigeria	9/4½	+6d
Jos Tin Area	13/3	.....
Kaduna Prospectors	2/4½	+1½d
Kaduna Syndicate	2/4½	+3d
London Tin	5/10½	.....
United Tin	3/6	—3d
SILVER, LEAD, ZINC		
Broken Hill South	2 3/16	+1/32
Burma Mines	2/6	+1½d
Consol. Zinc	29/6	+6d
Lake George	7/3	+10½d
Mount Isa	33/6	+1/3
New Broken Hill	24/-	+9d
North Broken Hill	2 3/32	+1/32
Rhodesian Broken Hill	9/3	+1½d
San Francisco Mines	18/3	+6d
Uruwira	3/7½	.....
MISCELLANEOUS		
BASE METALS & COAL		
Amal. Collieries of S.A.	41/6	.....
Associated Manganese	45/-	+1/-
Cape Asbestos	25/3	+6d
C.P. Manganese	59/3	+1/3
Consol. Murchison	39/6	—6d
Mashaba	4½d	+1½d
Natal Navigation	2 1/16	.....
Rhod. Monteleo	1/9	.....
Turner & Newall	75/-	—3d
Wankie	13/-	—1½d
Witbank Colliery	3 1/16 XD	.....
CANADIAN MINES		
Dome	$31	+2¼
Hollinger	$26	.....
Hudson Bay Mining	$81	+4½
International Nickel	$68¼	+1
Mining Corpn. of Canada	£4 1/16	+1/16
Noranda	$120	+1
Quemont	£5¾	.....
Yukon	3/9	.....
OIL		
Anglo-Iranian	10½	—1/16
Apex	44/4½	—7½d
Attock	41/3	—1/3
Burmah	74/3	—9d
Canadian Eagle	29/3	+7½d
Mexican Eagle	20/4½	—1½d
Shell (bearer)	5 1/16	+1/16
Trinidad Leasehold	19/4½	—7½d
T.P.D.	24/3	—9d
Ultramar	26/9	—3d

COMPANY NEWS AND VIEWS

Inco Produces More, Earns Less, Pays Less

The International Nickel Company of Canada during 1953 produced from underground and surface combined, a total of 13,667,095 tons of ore compared with 13,248,593 tons of ore in 1952. The 1953 production figure established yet another record and further reflects the excellent progress the company has made with its underground mining expansion scheme which has been under way for more than a decade.

Deliveries of INCO's Principal Products in 1951-1953

Year	*Nickel** (lb.) (000)	*Copper†* (lb.) (000)	*Products‡* (lb.) (000)	*Platinum Metals* (oz.)	*Gold* (oz.)	*Silver* (oz.)
1953	251,418	234,349	99,491	270,562	38,410	1,106,733
1952	249,017	234,323	92,350	287,135	42,396	1,076,327
1951	243,865	236,954	79,160	375,438	38,016	1,027,921

* All forms. † Refined. ‡ Mill and foundry products. The nickel content of the mill and foundry products was 76,078,733 lb. (1952—67,599,186 lb. ; 1951—60,175,252 lb.). These figures are included in the totals given under *Nickel*.

Net earnings for the year of U.S.$53,694,526, after provision for dividends on the preferred shares, were equivalent to U.S.$3.54 per common share, compared with U.S.$3.90 in 1952 and U.S.$4.17 in 1951 and U.S.$3.21 per share in 1950.

Consolidated Profit and Loss Account

Year	*Working Profit* U.S.$	*Taxation** U.S.$	*Net Profit* U.S.$	*Dividend per share* U.S.$	*Carry Forward* U.S.$
1953	117,369,902	43,945,837	53,694,526	2.35	175,969,102
1952	118,962,585	43,598,993	58,891,282	2.60	158,467,172
1951	126,831,710	48,148,718	62,875,571	2.60	139,413,028

* 1953 includes U.S. $28,085,338 reserved for Canadian taxes ; (1952 - U.S. $30,284,453.)

The decline of about 9 per cent from the net earnings of the preceding year was due principally to the generally higher cost of labour and materials and also to the increased provision for depreciation.

De Beers Again Pay 200 Per Cent

Following the maintained interim dividend of 80 per cent, De Beers Consolidated Mines have now recommended a final payment of 120 per cent or 6s. per 5s. share, making a total of 200 per cent for the year 1953.

The final dividend will be made on or about May 3 to all those registered on March 31.

The net profit for the year 1953, after providing £2,000,000 (£175,000) for taxation, was £9,317,801 compared with £10,092,399.

West Africans Announce Excellent Results in February

The February mine returns of the ten West African gold producers listed in the table below produced some excellent results.

Ariston announced a new high record for the tonnage crushed and gold produced which was the result of a slight improvement in the grade of ore treated, a lowering of costs by as much as 4s. 5d. per ton milled to 50s. 2d. and, of course, from the higher tonnage throughput. Amalgamated Banket's revenue however again suffered from the low grade Pepe section.

Ashanti and Bibiani both announced good returns. Ashanti's gold production was the highest since January 1952 and its profit figure was the best so far announced during the current financial year. Bibiani's profit figure also comes in for comment as the monthly profit figure was the best achieved since June 1953. Bremang announced a loss for the second month in succession, this being due partly to the fact that the company had only the services of three of its four dredges and during the month, one of these, its No. 4 dredge, was shut down for 14 days for the relining of a part of its main drive. Moreover, its No. 2 dredge, which commenced operations on the Offin River area at the end of January last, was busily engaged in working down to reach river level, involving thereby the digging of a substantial amount of bed rock. An early improvement in this company's results can be expected.

Gold Coast Main Reef returned the highest working profit and gold production for any month for several years, a fact made even more impressive because of the short month, while its tonnage throughput was the highest achieved during the current financial year.

Marlu did not establish any records, but its consistently good returns this year have enabled it to show a cumulative profit figure some £10,000 higher than in the corresponding period a year ago, all of which makes the prospects of this company returning shortly to the list of dividend payers much brighter. The company made its last dividend payment in respect of 1940-41 when 10 per cent was paid. In an issue of February 26 it was incorrectly stated that the company's last distribution was in respect of the year 1950-51.

Taquah and Abosso also announced the highest crushing figure for several years, but its working profit was reduced owing to increased expenditure on development work. Lyndhurst Deep crushed more in February than any one month since May 1952, and its working profit for the first five months of its current year show up to advantage when compared with that achieved in the corresponding period of the previous year. Konongo continues to forge ahead most encouragingly.

Company	*February, 1954* Tons (000)	Yield (oz.)	Profit (£000)	*Months since year end*	*Current Financial Year* Total to date Tons (000)	Yield (oz.)	Profit (£000)	*Last Financial Year* Total to date Tons (000)	Yield (oz.)	Profit (£000)
A.B.A.*	65	10,627	7.7	5	331	53,512	70.1	295	45,506	95.7
Ariston Gold	32	10,979	54.6	5	156	50,467	218.7	147	51,062	255.5
Ashanti	24	15,744	64.3	5	120	76,923	311.5	112	74,500	387.2
Bibiani (1927)	30	6,150	8.5	5	123	31,405	33.1	152	30,420	63.4
Bremang†	289	1,082	L 8.4	2	622	2,475	L 11.8	1196	5,537	17.4
G.C.M.R.	10	4,295	16.4	8	63	29,763	90.6	68	26,462	84.5
Kanongo	2	2,813	13.9	5	13	13,237	65.2	11	11,112	51.1
Lyndhurst Deep	1	1,108	5.2	5	4	5,946	28.3	4	5,361	26.6
Marlu Gold	39	3,522	8.4	5	199	20,176	75.3	205	20,663	65.1
Taquah & Abosso‡	27	6,186	4.9	11	279	56,951	101.9	248	58,451	L 13.9

* Low grade Pepe section again affected revenue
† Cu. yds. dredged — Dredge No. 4 shut down for 14 days for main drive relining
‡ Decrease in estimated profit due to additional expenditure on development

NOTE

As the basis for calculating monthly profits varies from company to company, a direct comparison one with another is not possible. The basis for any one company has, however, remained consistent unless otherwise indicated.

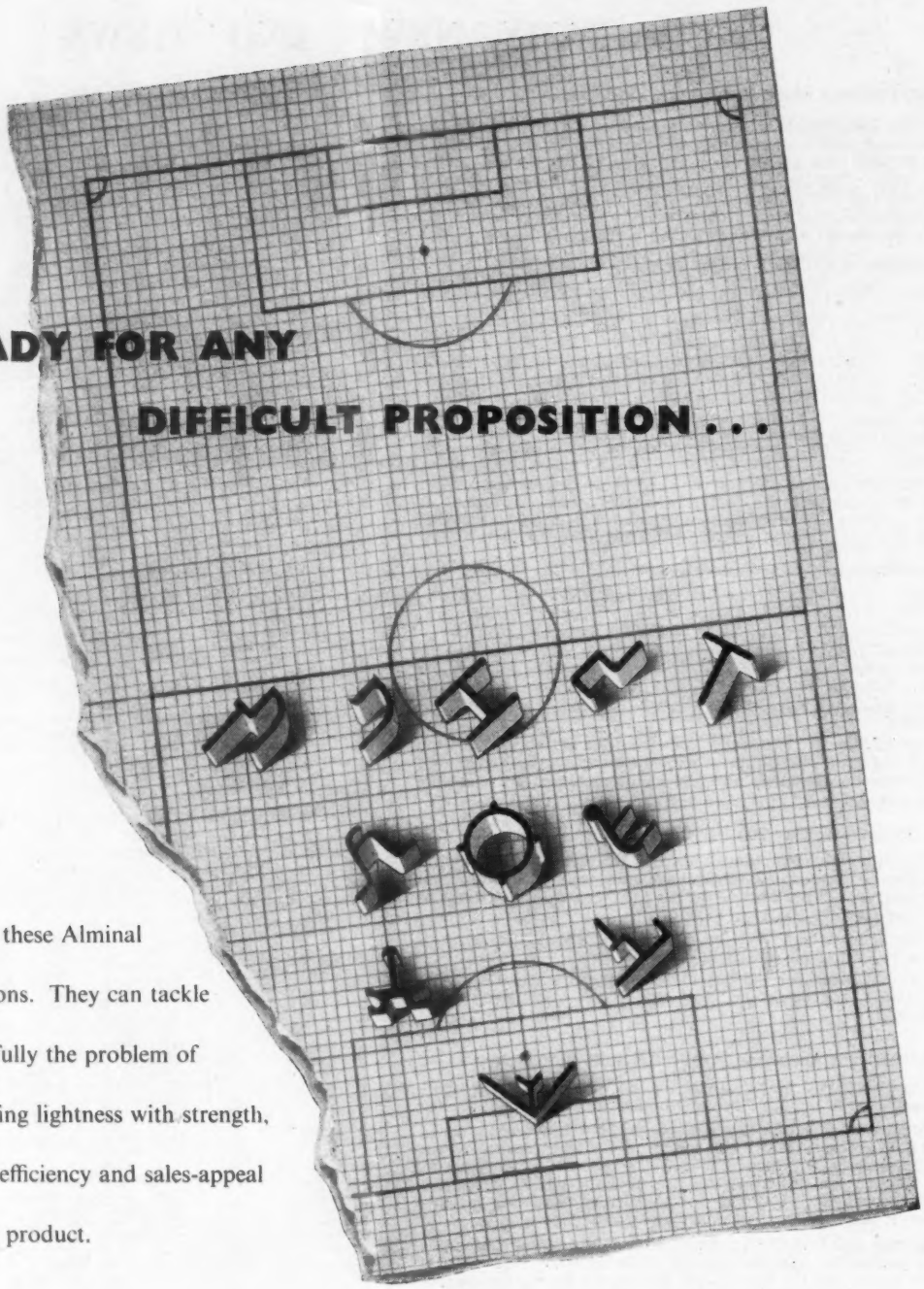
February Tin Returns

Of the tin and columbite producers whose production figures for February are given in the table below, together with their cumulative output totals to-date and the output achieved in the corresponding period a year ago, there are several companies whose results to-date appear particularly interesting.

Company	*Feb.*	*Months since year end*	*Financial Year to Date* This	Last	*Company*	*Feb.*	*Months since year end*	*Financial Year to Date* This	Last
EASTERN					**NIGERIA**				
Ampat	80½	2	180½	195½	Bisichi	47	2	102	86
Bangrin	34½	2	101	141	Bisichi*	16	2	38	24
Batu S.	17	5	118½	97½	Ex-Lands	70	2	140	129
Berjuntai	51½	10	531½	821½	Filani	3½	2	5½	10
Ipoh Tin	32½	11	345½	§	Gold & Base	54	2	97	103
Kamunting	115½	11	1270	1821	Gold & Base*	8½	2	19½	11
Kinta K.	17½	11	281½	171	Jantar Nigeria	18	5	84	92
Kinta T.	24½	2	51	36½	Jantar Nigeria*	18	5	90	96
Klang River	28½	11	434½	316½	Kaduna P.	6	2	14½	20
Kuala K.	143	11	1756½	2004	Kaduna S.	24½	2	56½	50
Kuchai	15	5	137	306½	Keffi	6	11	53½	250
Larut	74½	2	153	83½	Keffi*	24	11	163½	—
Lower Perak	151½	10	1082½	1089½	Naraguta Ex.	3½	2	9	17½
Malaysiam T.	13	11	113½	60½	Naraguta K.	17½	2	33½	22½
Rahman Hyd.	40	8	325½	320½	Naraguta T.	15½	2	31½	40½
Rantau	75½	8	501½	652½	Naraguta T.*	8	2	15	6½
Rawang Conc.	51½	11	650½	688	Ribon	9	11	113	103
Renong	150½	8	797	231	Rukuba	1½	11	24½	22
S. Kinta	330½	11	4195½	3985½	S. Bukeru	6½	2	16½	12½
Siamese Tin	116½	2	248	§	Tinfields of Nig.	1½	11	24	20
Sungei Kinta	16	2	30	§	Tinfields of Nig.*	1	11	2.22	—
Taiping	54	2	109½	§	U. Tin	7	8	62	98
Tambah	17	2	38½	17½					
Tanjong	48½	2	106½	121½	**MISC.**				
Tongkah	11½	8	290½	457	Beralt Tin†	175	11	2097	1944
					Beralt Tin	7	11	81	134
NIGERIA					Geevor	54	11	622	542
Amal. Tin	303	11	3679	4274	S. Crofty Tin	49½	2	103	91½
Amal. Tin*	56	11	656	515	S. Crofty Tin†	½	2	½	—

* Columbite † Wolfram § Only quarterly figures available last year

Renong, which was singled out for comment in our issue of December 4 last, continues to make excellent progress and the share has been very active recently. Another company which is going ahead is Naraguta Tin Mines, about which it will be recalled there was an unsuccessful "take over" bid in October last. Its columbite production during the first two months of its current financial year advanced to 15 tons compared with 6½ tons in the corresponding period of the preceding year. Thus its columbite production is running at an annual rate of approximately 90 tons—a total which if achieved, would be 24



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tons higher than any previous figure the company has recorded in past years.

Naraguta Karama's results to-date also indicate that operations are currently being conducted on a larger scale than in recent years and if the present production rate can be maintained the year-end total should be approximately 190/200 tons, which would be the best total achieved since 1948.

Larut Tin Fields, with only two months of its current financial year completed, has produced 70 tons more than in the corresponding period of a year ago. If production can be maintained at this level the year-end total will be well in advance of the 1953 total of 685 tons and close to the 1,000 tons mark, which was achieved in 1949.

In the "miscellaneous" section, Beralt's cumulative total to-date shows an increase of 153 tons of wolfram over that achieved in the corresponding period of the previous year; while Geevor, with one more month to complete its financial year, looks very much like surpassing last year's output by 80 or more tons.

Miscellaneous Gold Returns—January

Geita Gold, the Tanganyika producer, announced the lowest tonnage throughput and gold output in January since April, 1953, but even so, its cumulative totals to date still show a decided improvement over those achieved a year ago. New Guinea gold fields, whose monthly crushing rate has shown a perceptible improvement since September last, has not yet been able to match this increased crushing rate with gold production.

St. John d'El Rey has commenced the current year badly but British Guiana Consolidated appears to have struck a good patch of dredging ground as is indicated by the ratio of yield to dredge throughput compared with the corresponding period of the previous year. Clutha River continues its struggle to maintain production at the same rate as last year, comment which in no way applies to Suadi Arabian, whose profit to date is nearly double that achieved in the previous year—extracted from some 10,000 tons less ore. It will indeed be interesting to see this company's report and accounts covering the past year's results.

MISCELLANEOUS GOLD RETURNS - JANUARY

Company	January, 1954		Months since year end	Current Financial Year Total to date		Last Financial Year Total to date	
	Tons (000)	Yield (oz.)		Tons (000)	Yield (oz.)	Tons (000)	Yield (oz.)
Br. Gu. Consol.	168·9*	1,656	1	168·9*	1,656	207·7*	1,049
Clutha River ..	232·0*	385	10†	2,231·0*	4,667	2,170·0*	4 959
Frontino	9·1	6,360	1	9·1	6,360	9·7	5,097
Kentan (Geita).	20·0	2,954	7	152·8	23,146	145·0	21,104
New Gu. G'flds.	3·3	1,155	4	12·4	5,080	10·9	7,943
Saudi Arabian‡	9·5	£46,398	11	101·7	£264,919	111·8	£145,013
St. Johnd'El Rey	26·8	£123,000§	1	26·8	£123,000§	32·6	£257,405

* Cu. yds. dredged † 4 weekly period since year end ‡ November figures
§ Estimated realizable value

Southern Rhodesian Gold Figures—January

Motapa Gold in its first monthly return for the current year continues to maintain the improvement in its profit figures begun last October. Indeed, it is encouraging to note that the working profit for January greatly exceeded the corresponding figure announced in the preceding year which was obtained from a considerably higher tonnage throughput and virtually the same gold output.

Rezende, in the London and Rhodesian Mining and Land group, announced a loss for the fifth month in succession although Cam and Motor, also in the same group, announced another good return and its cumulative results to date show up well when compared with those achieved in the corresponding period in the preceding year.

SOUTHERN RHODESIAN GOLD RETURNS - JANUARY

Company	January, 1954			Months since year end	Current Financial Year Total to date			Last Financial Year Total to date		
	Tons (000)	Yield (oz.)	Profit (£000)		Tons (000)	Yield (oz.)	Profit (£000)	Tons (000)	Yield (oz.)	Profit (£000)
Arcturus	3·3	—	3·4	7	21·7	—	20·6	21·9	—	21·5
Cam & Motor	25·5	7,888	46·2	7	170·2	53,013	314·7	166·5	43,893	279·7
Connaught	0·8	—	1·5	7	5·6	—	10·2	5·0	—	13·3
Falcon Mines	17·1	2,706	7·1	4	66·4	10,733	25·1	102·9	15,573	32·4
Globe & Phoenix .	6·0	3,521	23·3	1	6·0	3,521	23·3	6·0	3,150	19·8
Motapa Gold*	18·5	2,469	3·6	1	18·5	2,469	3·6	22·4	2,440	0·9
Muriel Mine	3·1	—	6·9	7	14·3	—	48·3	6·8	—	51·0
Rezende	6·6	1,170	L 0·1	1	6·6	1,170	L 0·1	7·7	1,253	2·5
Tebekwe	8·5	—	2·8	7	57·4	—	18·4	55·6	—	22·8

Excluding premium gold sales L indicates a loss

Australian Gold Returns—January

Perhaps the most outstanding monthly return of the Australian gold producers listed in the table below was that of Harrietville (Tronoh), the Western Australian gold dredging company whose recovery and profit were the highest recorded since February of last year.

With only two more returns to come to complete eight out of the 12 companies listed in the table, the picture as to what their year-end results will be is much clearer. Boulder Perseverence and Gold Mines of Kalgoorlie will show almost certainly an improvement over the preceding year. Morning Star also comes into this category and it would appear that this company is continuing to work a higher grade of ore than in the previous year.

AUSTRALIAN GOLD RETURNS - JANUARY

Company	4 weeks to January 26		4 weekly period since year-end	Current Financial Year Total to date		Last Financial Year Total to date	
	Tons (000)	Yield (oz.)		Tons (000)	Yield (oz.)	Tons (000)	Yield (oz.)
Boulder Perseverance .	10·6	2,599	11	111·5	27,482	110·7	25,194
Central Norseman ...	12·3	6,478	11	131·0	63,870	137·5	68,652
Central Victoria	245·8*	1,080	11	2356·7*	8,431	1878·6*	9,308
Golden Horse Shoe ..	77·5	800	1	77·5	800	78·6	788
G.M's of Kalgoorlie ..	15·6	4,292	11	165·6	47,870	145·9	40,358
Harrietville (Tronoh)*	£a13·7	0·9	6	£a65·1	4·1	£a58·0	3·8
Kalgoorlie Enterprise .	5·0	1,345	11	55·9	15,506	52·0	15,737
Morning Star	1·4	1,024	11	15·3	14,955	18·1	12,500
New Coolgardie	4·8	2,056	11	58·6	27,147	54·7	28,546
North Kalgurli	19·4	4,185	1	19·4	4,185	29·6	5,223
Sons of Gwalia	7·6	1,545	1	7·6	1,545	8·6	1,845
South Kalgurli	8·9	1,751	11	97·0	19,434	81·3	18,020

* Cu. yds. dredged

Coal Producers' Good Results in January

The January production figures of some of the leading South African coal producers listed in the table below yielded some good results.

JANUARY COAL OUTPUTS

Company	January	Months Since Year End	Cumulative Totals	
			This year to date	Last year to date
Amal. Coll. of S.A.	578,123	1	578,123	621,361
Apex	81,496	1	81,496	78,267
Blesbok	44,672	1	44,672	51,125
Coronation	101,218	1	101,218	95,323
Dundee	39,022	1	39,022	35,847
Natal Navigation	102,745	1	102,745	110,215
New Clydesdale	73,612	1	73,612	45,859
New Largo	64,716	1	64,716	24,998
S.A. Coal Estates	146,870	1	146,870	147,380
Sprinbok	69,959	1	69,959	74,289
Transvaal & Delagoa Bay ..	128,168	5	629,915	—
Van Dyks Drift	61,296	1	61,296	56,427
Vierfontein†	60,885	1	60,885	—
Vryheid Cor.	42,086	1	42,086	42,250
Vryheid Cor.*	35,011	1	35,011	37,244
Wankie Colliery	215,502	1	215,502	211,262
Wankie Colliery*	11,962	1	11,962	12,118
Witbank‡	160,372	1	160,372	134,843

* Coke † Started production in May 1953
‡ Started production in September 1953

New Clydesdale announced yet another good return thereby maintaining its level of output at over 70,000 tons per month begun in June, 1953. New Largo announced the second highest return since it came into production in January, 1953. But Witbank's output of 160,372 tons was definitely a record, as was the January figure announced by Vierfontein which came into production in May, 1953; while that given for Coronation reveals an output figure which has not been exceeded since May, 1951, when 102,056 tons were produced. On the other hand, Blesbok reported the lowest output since February, 1952. Wankie Colliery is maintaining its production at a slightly higher figure than in the corresponding period in the preceding year, but it will have to do much better in the coming months if hopes that it will be able to supply to Copperbelt's needs by July next are to be fulfilled.

Oil Returns in January

The January output figures for ten of the leading oil companies listed in the table below did not provide anything unusual. On the other hand, the returns announced were average or better and the year-end total shown for Kuwait was an improvement of approximately 4,500,000 tons over the preceding year.

OIL OUTPUT FOR JANUARY

Company	January (in tons)	Months Since Year End	Cumulative Totals (in tons)	
			This year to date	Last year to date
Anglo Ecuadorian	26,195	10	262,414	248,701
Apex Trinidad	37,800	4	149,098	149,426
Kern Oilfields	27,575	8	221,293	207,711
Kuwait Oil*	3,983,242	12	42,603,244	37,042,122
Lobitos Oil	40,949	1	40,949	38,645
Trinidad Central	7,907	1	7,907	7,160
Trinidad Leaseholds	76,077	7	527,831	519,044
Trinidad Petroleum	40,345	6	237,474	250,063
Ultramar Oil	112,337	1	112,337	† ———

Note :—1 ton taken to equal seven barrels
* Figures for the month of December
† Figures for last year issued quarterly

African and European Investment Maintain Dividend

African and European Investment Company have announced the payment of 2s. 6d. per 10s. stock unit or 25 per cent, the same as was paid in the preceding year. The dividend will be paid to all those registered on March 31, and to persons presenting coupon No. 6 from stock warrants to bearer. Dividend warrants will be posted about April 28.

Subject to final audit the profit for the year 1953 after providing for taxation was £724,194 compared with £769,344. The allocation to reserves was increased by £50,000 to £300,000.

Rhodesia-Katanga Reports Small Profit

The untaxed profit of Rhodesia-Katanga for the calendar year 1953 was £533, compared with a loss of £202 in 1952. Taxation took £323 (£84), so that the net profit, after providing for all charges, was £210. The debit balance carried forward was £292,529 against £259,287 brought in. Meeting, London, April 29.

British Malayan Tin Syndicate Closes Down

British Malayan Tin Syndicate announced recently that at the present price of tin the company could not continue to operate its mill at Basset in Cornwall as an economic proposition. The company has shown a loss on its operations since May and it was decided to suspend operations and to convene meetings to place the company in voluntary liquidation. The meeting for this purpose was held on March 15.

THE NATIONAL BANK OF INDIA, LIMITED

The Annual General Meeting of The National Bank of India, Limited, will be held on April 6 at 24 Bishopsgate, London, E.C.

The following are extracts from the statement by the Chairman, **Mr. J. K. Michie,** which has been circulated to shareholders with the report and accounts for the year ended December 31, 1953:—

Throughout 1953 the world continued to struggle, if haltingly and painfully, towards a more natural balance in the conduct of international commerce, and in this country the movement has been assisted by the decontrol of certain imports, the gradual derationing of consumer goods, and the reopening of terminal markets.

On the other hand, some primary producer countries still hold the view that by bulk selling through Government controlled bodies rather than by using marketing systems through which sellers and buyers would be in daily touch, they can sell their produce more effectively and at the same time ration their sales in accordance with their views of international values. Generally speaking, bulk selling flourishes only in a sellers' market, and temporarily anyhow these conditions have disappeared. But the greatest remaining obstacle to the free flow of international trade undoubtedly is the absence of free convertibility of currencies. Without that background international markets, including terminal markets, cannot function fully or to the best advantage of buyer and seller; to have differing values in one currency for the same goods simply because "A" is produced in the dollar area and "B" in the sterling (or some other) area is not only superficially wrong, it is dangerous, and that is one of the problems of adjustment which will concern merchants and bankers when free convertibility is possible and does happen.

The year 1953, therefore, was an uneasy one, though with certain bright spots in our particular geographical field, and I am pleased that we are able to show figures which, while reduced both in respect of balance-sheet totals and of profits, are nevertheless satisfactory.

THE ACCOUNTS

Turning to the accounts for 1953, the total of the consolidated balance-sheet shows a reduction of £7,014,168 to £136,452,974.

The figure relating to the National Bank of India, Ltd., alone has fallen by £7,318,127, occasioned entirely by a drop in total deposits which was accompanied by a corresponding fall in outstanding advances.

After making full provision for taxation and other necessary reservations, net profits are £376,266, a reduction of £5,178 as compared with 1952 results.

Our programme of rebuilding outdated and inadequate banking premises at some of our main branches continues and will not be completed until 1956. Our fine new offices in Kampala and Karachi we hope will be occupied in June of this year. Aden and Dares-salaam are now being tackled, and apart from an addition to our Nairobi building, these will be the last of the major building projects we foresee. We are again allotting £75,000 to properties account and intend to continue a steady policy of depreciation on these lines.

Contingencies reserve account gets £100,000 as against £115,000 last year, the net cost of our dividend having been increased by the reduction of the rate of income tax.

DIVIDEND POLICY

We decided to continue for 1953 our recent rate of dividend distribution of 16 per cent. I wish to point out, however, that on a pre-profits-tax basis this costs practically 20 per cent. While over the war years our shareholders suffered less than most in fluctuating dividends and consequently in temporarily reduced share values, we are nevertheless very conscious of their loyal acceptance of our dividend policy since then. We are also aware that certain aspects of our capital structure are out of line with modern needs and practice, and as you have seen, we are proposing at an extraordinary general meeting which will immediately follow the annual general meeting to ask you to pass certain resolutions.

These measures have two purposes, the first to take our shares out of what is known as the "heavy" category and so encourage the smaller investor, the second to bring the capital more into line with realities while maintaining an adequate reserve fund.

At our last meeting I was asked when shareholders are to be given tangible benefit from the expansion of our business and our earnings since the present rate of dividend was established and I assured the questioner that this part of the responsibilities of your board had not been forgotten.

RISING COSTS AND COMPETITION

As you know the expenses of running a business continually tend to rise; then competition in all our areas is steadily increasing; and lastly, in this uncertain world it would be most injudicious of me to make any firm prophecy of what will be done or of what will be possible some months from now; but in putting before you these proposals in regard to our capital we do it in the hope that there will be some increase in the amount to be distributed to the shareholders. I do not however encourage any expectation of the same rate being maintained on the increased capital.

Grindlays Bank Ltd. shows a smaller profit for 1953. They are opening in the Rhodesias and that means an increase in expenses which will not be balanced by revenue until the new branches are more firmly established.

Our Finance and Development Corporation continues to expand its business on sound lines.

A special feature of our expansion has been the long delayed opening of our West End branch at 13 St. James's Square, which started business on December 7. I understand the improved facilities thus afforded to our trustee and income tax departments are appreciated by our customers and a steadily increasing number of our overseas clients will doubtless use St. James's Square for their ordinary business. Our staff will welcome any shareholder or customer who wishes to see this fine office.

Again I wish to express sincere thanks to a loyal and enthusiastic staff. I personally have met a great many of them and know they have a keen interest and great pride in the Bank.

Finally, with such a management and staff and our resources and organization behind them, I look forward to the immediate future with confidence.

THE NATIONAL BANK OF INDIA, LIMITED

Registered in London under the Companies Act of 1862 on the 23rd March, 1866

ESTABLISHED IN CALCUTTA, 29th SEPTEMBER, 1863

Subscribed Capital	£4,562,500
Paid-up Capital	£2,281,250
Reserve Funds	£3,675,000
Number of Shareholders	3,034

HEAD OFFICE - 26 BISHOPSGATE, LONDON, E.C.2.

BALANCE-SHEET, 31st DECEMBER, 1953

	£	1953 £	1952 £
CAPITAL—Authorised and Subscribed—182,500 Shares of £25 each	4,562,500		4,562,500
Paid-up £12 10s. per Share		2,281,250	2,281,250
RESERVE FUNDS—Including Share Premium Account, £1,128,750 (1952—£1,128,750)		3,675,000	3,675,000
PROFIT AND LOSS ACCOUNT :— Profit unappropriated		275,496	274,980
		6,231,746	6,231,230
CURRENT LIABILITIES, PROVISIONS AND OTHER ACCOUNTS :—			
Current and other Accounts, including provision for diminution in value of assets, taxation on profits to date and reserves for contingencies	80,633,364		89,004,213
Fixed and Short Deposits	22,930,054		21,927,618
Amounts due to Subsidiary Companies	2,950,553		2,864,042
Loans Payable	370,875		740,663
Bills Payable	1,985,116		1,584,541
Acceptances for Customers	938,205		1,010,296
Second Interim Dividend, less Income Tax for the year ended December 31, 1953	100,375		95,812
		109,908,542	
		£116,140,288	£123,458,415

	£	1953 £	1952 £
CURRENT ASSETS :—			
Cash on Hand, at Call and Short Notice and at Bankers		16,778,011	20,345,056
Investments at under Market Value :—			
British Government and other Securities quoted on the London Stock Exchange	11,319,563		11,483,585
Indian, Pakistan and Ceylon Government and other Rupee Securities quoted on Overseas Stock Exchanges	10,989,062		9,876,253
East African Government Securities amounting to £1,048,575 and other unquoted Investments	1,070,824		991,488
		23,379,449	
Bills of Exchange, including Treasury Bills		25,865,761	23,722,144
Advances, Loans Receivable and other sums due to the Bank		45,864,249	53,317,597
Customers for Acceptances per Contra		938,205	1,010,296
Total Current Assets		112,825,675	120,746,419
SUBSIDIARY COMPANIES :—			
Shares at cost less amounts written off	1,450,000		1,450,000
Amounts Due	159,770		—
		1,609,770	
FIXED ASSETS :—			
Bank Premises, Property and Furniture at cost, less amounts written off		1,704,843	1,261,996
		£116,140,288	£123,458,415

NOTES :—

(1) Securities to the nominal value of £763,685 (1952-£642,500) have been lodged as security for Government accounts and for guarantees issued to Indian Government Departments.

(2) Bills receivable rediscounted £139,534 (1952-£115,814) of which up to March 8, 1954, £82,248 have run off.

(3) Forward contracts outstanding for the purchase and sale of Bills and Telegraphic Transfers £33,085,235 (1952-£46,929,156).

(4) Liabilities have been incurred in respect of building contracts for new premises amounting to approximately £427,000 (1952-£565,107).

(5) There are contingent liabilities in respect of confirmed credits outstanding amounting to £7,975,079 (1952-£9,233,520).

(6) There are contingent liabilities in respect of guarantees entered into in the ordinary course of business.

(7) Overseas Current Assets and Liabilities have been converted at the rate of 1/6d. per Indian Rupee, 1/6d. per Ceylon Rupee, 1/6d. per Burma Kyat, 2/2d. per Pakistan Rupee and £1 per 20 East African Shillings, and other currencies at the rates of exchange ruling on December 31, 1953.

N. W. CHISHOLM, *General Manager*
D. A. DEELEY, *Accountant*

J. K. MICHIE
W. H. MILES
E. J. MACKENZIE HAY
} *Directors*

REPORT OF THE AUDITORS TO THE MEMBERS

We have obtained all the information and explanations which to the best of our knowledge and belief were necessary for the purposes of our audit. In our opinion proper books of account have been kept by the Bank so far as appears from our examination of those books and proper Returns adequate for the purposes of our audit have been received from Branches not visited by us. We have examined the above Balance Sheet which is in agreement with the books of account and Returns. In our opinion and to the best of our information and according to the explanations given to us the said Balance Sheet gives the information required by the Companies Act, 1948, in the manner thereby authorised for Banking Companies and on such basis the Balance Sheet gives a true and fair view of the state of the Bank's affairs as at 31st December, 1953.

We have also examined the annexed Consolidated Balance Sheet and Consolidated Profit and Loss Account of the Bank and its Subsidiaries dealt with thereby with the audited accounts of those Companies. In our opinion such Consolidated Balance Sheet and Consolidated Profit and Loss Account have been properly prepared from such accounts in accordance with the provisions of the Companies Act, 1948, in the manner thereby authorised for Banking Companies and, on this basis, give a true and fair view of the state of affairs and of the profit ascertained in the manner therein indicated of the Bank and its Subsidiaries so far as concerns members of the National Bank of India, Limited.

London, 9th March, 1954.

COOPER BROTHERS & CO.
W. A. BROWNE & CO.
} *Chartered Accountants.*

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Mining Matters

Mond Nickel Fellowships, 1954.—The Mond Nickel Fellowships Committee now invites applications for Fellowships of an approximate value of £900 to £1,200 for 1954. Fellowships will be awarded to selected candidates of British nationality with degree or equivalent qualifications, to enable them to obtain wider experience and additional training in industrial establishments, at home or abroad, to make them more suitable for future employment in senior technical and administrative positions in British metallurgical industries. Each Fellowship will cover one full working year. Applicants will be required to state details of the programme they wish to carry out. Particulars and forms of application are available from the Secretary, Mond Nickel Fellowships Committee, 4 Grosvenor Gardens, London, S.W.1. Application forms are required by June 1.

New Uses and Applications for Tin.—A conference, organized by the Tin Research Institute, which was held at the Maison de La Chimie, Paris, on March 2, discussed new uses and applications for tin. Subjects discussed at the conference were "Sand Cast Tin Bronzes" which was introduced by Mons'eur M. G. Blanc, director of Research of the French Foundry Industry; "New Aluminium-Tin Bearing Alloys," introduced by Dr. J. W. Cuthbertson, Assistant Director of Research at the Tin Research Institute; "New Copper-base Alloys Containing Tin," introduced by Dr. E. C. Ellwood, Chief Metallurgist at the Tin Research Institute; and "Applications of Tin-base Bearing Alloys," introduced by Monsieur P. Dehais, Director of the Tin Information Centre of France.

The Tin Research Institute has opened a new office in Dusseldorf, Germany, which will be under the direction of **Dr. Ing. D. Keysselitz,** a leading German metallurgist who has made a special study of tin, including some months at the Tin Research Institute in London.

The new office will provide German manufacturers with technical service and with information concerning the latest developments in the use of tin and tin-alloys.

The Tin Research Institute now has technical service offices in the United States and Canada, and in Belgium, France, Holland, Italy and Sweden.

DIVIDENDS

African and European Investment 25%
Aluminium Corporation 12½% (April 15)
Ashanti Goldfields 20% (May 6)
Ayer Hitam Tin Dredging 1s. *i*
Bibiani (1927) 5% (May 6)
Chartered Bank of India, Australia and China 7%
De Beers Consolidated Mines Def. 120% (May 3)
English Electric Co. 1s. 4d.
Harrisons and Crosfield 4% *i* (April 8)
Hilger and Watts 7½%
International Combustion Holdings 15% (April 2)
John Summers and Sons 5½%
Kinta Tin Mines 7½% *i*
Malayan Tin Dredging 1s. *i* (April 15)
Manganese Bronze and Brass 12½% (June 5)
Natal Steam Coal 10%
New Broken Hill Consolidated 15%
Nigerian Electricity Supply 4% (May 1)
North Kalgurli (1912) 12½% *i*
Sir Lindsay Parkinson 2½% *i* (April 1)
Southern Malayan Tin Dredging 1s. *i* (April 13)
Sungei Besi Mines 4 4/5d. *i*
Tanjong Tin Dredging 7½% *i* (April 7)
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i interim

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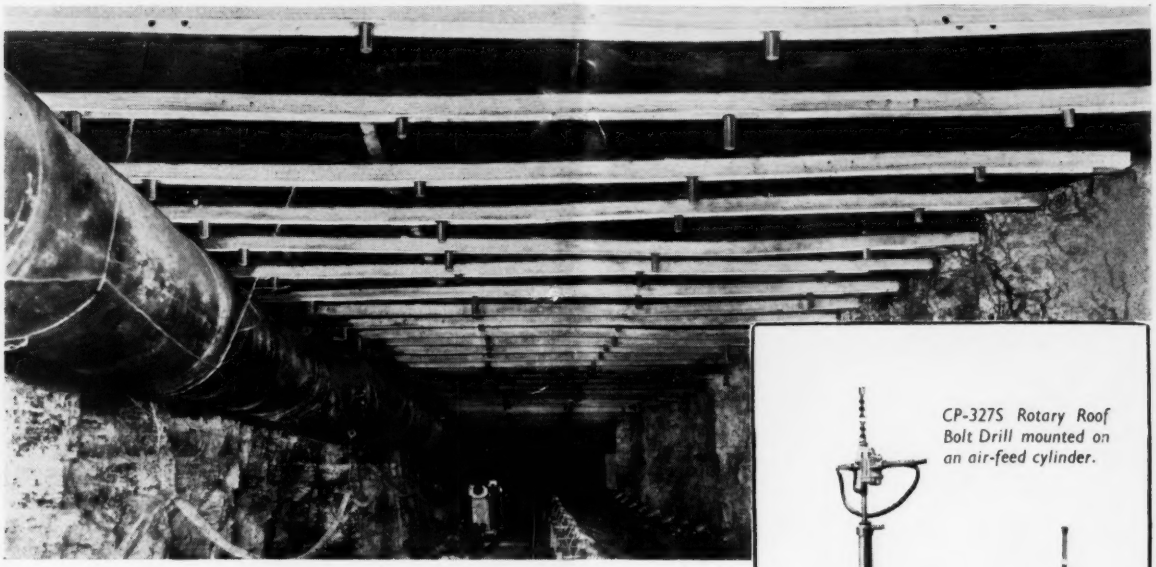

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